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AERIAL AGE
WEEKLY

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A YEAR OF AERIAL AGE

TO-DAY AERIAL AGE enters into the second year of its activity and usefulness. Just a year ago we announced that "AERIAL AGE is to be the weekly organ of the aeronautical industry. It will give plenty of news about the constructors, aviators, clubs, technical developments, inventions, and so forth. Its editorial policy will be to protect the interests of the industry. It will start with an aggressive campaign against those Congressmen who opposed the aeronautical appropriations for the Army and Navy and will print their names and absurd statements weekly. It will fight the constructors' fights at Washington—and everywhere else."

It gives us very great pleasure to have our efforts as enthusiastically endorsed as we have during the past year and especially during the past week, when many of our friends have felt compelled to express their opinion concerning our services to the industry. Just a few of these comments are reproduced herewith.

Commencing the new year we would but reiterate our policy of a year ago—backed by enthusiasm and experience which has accrued during the most wonderful year of American aeronautical achievements.

Mr. Henry A. Wise Wood, Chairman of the Conference Committee on National Preparedness and Vice-President of Aero Club of America:

"I want to offer you my hearty congratulations upon your superb publication, and upon the able manner in which it has been conducted. I regard it one of the greatest assets of the aeronautic movement, and believe that its influence for good has been more widespread than you are aware.

"As AERIAL AGE is about to end its first year, I cannot refrain from taking this opportunity to express for it my admiration."

Mr. Robert Glendinning, Robert Glendinning & Co., Bankers, Philadelphia, Pa.:

"Your publication has done tremendous good throughout the country in advancing the cause of aviation and in the development of the art which I am sure will fill a much-needed want."

Mr. Charles Jerome Edwards, Montague and Court Streets, Brooklyn, N. Y.:

"What I like about the AERIAL AGE is that it is up-to-date, and is issued promptly from week to week.

"It is not only the last word in matters aerial, but it embodies the progressive thought and constructive ability of all scientific features which make for the development, extension and perfection of aerial flight.

"I want to thank you personally and to express emphatically my appreciation of the good work that the AERIAL AGE has done in the past year, and its service to all those interested in this great feature of the world's progress and service."

Major-General Commandant George Barnett, U. S. Marine Corps, Washington, D. C.:

"I wish to state that I am, not only as an officer of the service, but personally, very greatly interested in aeronautics, and especially in aeronautics as to its future application for the defense of our country. The war in Europe has, more than anything else, made it self evident that aviation is one of the most important elements of offense and defense yet produced.

"Of course we know but little as to the use to which flying machines have been put in this war, but everything we have learned goes to show that the flying corps of any army is a very important part thereof. Its use in scouting cannot be over-estimated, and from all available reports it seems to be thoroughly demonstrated that aviators are of the greatest possible value in spotting the fall of shell fired by a distant battery.

"Personally I have no doubt that a great deal of the success resulting from bombardments has been due to the accurate spotting by aviators. While the different flying corps have been of the greatest possible service, I cannot help but believe that it is still in its infancy, and that the future will show even greater development along the same lines with certainty, and other development along lines yet unknown.

"Aeronautics will also, in the future, form a very important part of naval offense and defense. Without doubt it will soon be entirely practicable for scouts of the fleet to carry flying machines far from the coast and launch them for the most valuable kind of scouting duty. In this way the radius of such scouts will be very materially increased, thereby bringing to the commander of the scouting force the most valuable possible information as to the position of the enemy.

"In addition to this, if it should ever become necessary to attack any port, members of the aviation corps would be of inestimable value in locating the mine fields defending that port. In case of war it would also be absolutely essential that there should be many aviation stations along our coast, so that our scouts could proceed from these bases out to sea and give ample warning of the approach of the enemy.

"In case of war, it would undoubtedly be necessary to employ the services of almost every aviator possible to get hold of, both professional and amateur. It has been noted with great satisfaction that the different organizations of the naval milita are taking great interest in aviation and will soon be supplied with machines and trained aviators. These would form a most valuable auxiliary to the navy in case of war, and in my opinion every possible encouragement, both national and state, should be given to the subject of aeronautics. This should extend not only to the use of the ordinary machines for flying over land or water, but should extend to dirigibles and kite ballons; and every possible exertion should be made not only to improve the state and national aeronautic defenses, but along with them should go the subject of wireless, which will add very materially to the service they can render.

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

"The country is to be congratulated on the fact that so many Americans are taking a deep interest in the subject of aeronautics, and this spirit should be fostered in every possible way."

Mr. W. T. Thomas, President The Thomas Bros. Aeroplane Co., Inc.:

"At the present time we are most optimistic regarding the future of aviation, especially in this country.

"The work done by a number of American manufacturers during the past year, I consider to be merely a forerunner of what may be expected in the very near future. Also, I believe that the commercial use of aviation is now very near at hand, and that within a very short time the mail, passenger and express routes which you have so often predicted in your papers, will be commonplace.

"Large machines will make daily trips from city to city, first in the form of a novelty and for purposes of demonstration, finally in the course of regular business requirements. Instead of the engines being the light, 'high-strung,' unreliable variety, with a factor of safety of from 0 to possibly 2, they will without doubt merge into the heavy duty class with a factor of safety in the neighborhod of from 6 to 8. Almost all machines except the very smallest will have folding wings, so as to be economical of hangar space. The body work and accommodations for the pilot and crew will be almost luxurious. Heated and enclosed cabins will be absolutely necessary for traveling in comfort at high altitude.

"In conclusion, I wish to state that our firm has had a very prosperous 1915 and further to express an appreciation of your very valuable work in Aerial Age and *Flying*, in educating the American public in the use and possibilities of Aircraft."

Mr. Charles B. Page, Vice-President and Treasurer Van Blerck Motor Co.:

"Permit us to congratulate Aerial Age on the completion of its Volume I. Every one of the fifty-two issues have been full of interest, news items, engineering information, etc.

"But what we like best about Aerial Age is the big part it has played in promoting the industry to which it is devoted. You have most ably set forth the usefulness of the Aeroplane for business and pleasure, and its necessity from a military standpoint.

"You have our heartiest congratulations for a most successful initial volume, and our sincere best wishes for your future prosperity."

Mr. Elmer A. Sperry, of The Sperry Gyroscope Company, New York:

"I wish to congratulate you on successfully attaining the First Anniversary of your useful publication. The devotees of the art of aeronautics deserve commendation and encouragement. I am interested in all efforts toward the advancement of this great art, because I believe that it is destined to be one of the most important aids to our Army and Navy.

"With best wishes for your continued success, etc."

Mr. John E. Sloane, President Sloane Manufacturing Co.:

"We want to tell you how much we have enjoyed reading the issues of Aerial Age which we have been receiving for some little time. What we particularly like about this magazine is its clear exposition of the rapid development in aeronautics, as well as its numerous technical articles and up-to-the-minute news."

Mr. G. C. Loening, Vice-President and General Manager Sturtevant Aeroplane Company:

"In view of the approaching anniversary of the publication of Aerial Age you will be interested to know that in a short space of time we have become so accustomed to considering Aerial Age as a definite unit in the machinery of the new industry that we hardly realize how quickly it has become established and recognized as the representative weekly trade paper.

"Not only is this an indication that there was great need for a publication of this kind, but its success is a tribute to the energy, foresight and ability of its founders.

"We assure you of our keen appreciation of the value of your work."

Mr. Arthur V. Farr, Adv. Manager, S. K. F. Ball Bearing Co.:

"Aerial Age has been selected as our medium through which to advertise our ball bearings because, as a result of our investigation, it appeared to be a paper which appealed to the aeronautical world, and the interest shown in our publicity up to date would lead us to be pleased with the selection.

"With the approach of your first anniversary we wish you all success."

Mr. G. J. Kluyskens, 112 West 42d Street, New York:

"It affords me pleasure to state to you that Aerial Age has become an indispensable factor for anyone who wishes to remain in touch with aviation in all parts of the world.

"I have had occasion to notice that your paper seems to penetrate not only in all corners of the United States but also is read in the most remote parts of Central and South America.

"I sincerely trust that the circulation of Aerial Age will grow with its usefulness."

Mr. Benjamin S. Foss, Manager Aeronautical Dept., B. F. Sturtevant Company:

"If present indications do not belie themselves, we in America are on the eve of a great awakening in things aeronautic. The expansion which has taken place in the industry during the last year, and the marvelous development in productive capacity, method and design, presage a much greater expansion in the next few years. This expansion, however, must be controlled by conservative forces and directed with foresight and patriotic motives.

"Let us remember that we are first, last, and always Americans, and that our duty and interest is to our own government.

"We, in the industry, are very grateful to the European buyers who have placed large orders in this country, and have thus enabled American manufacturers to expand their business to a profitable point and to work out productive methods which might not have come for a decade under normal conditions.

"We must, however, keep in mind that the great business of the future will come from the United States, and that future development in this industry will be actuated by the demands of the United States Government and the many private interests which are taking up aviation.

"The Sturtevant Company has concentrated its energies exclusively on the American demand for aviation products and development in design, construction and tests are being carried on with this end in view. The requirements of the United States Government are paramount, and we recognize and appreciate these requirements as a part of our patriotic duty.

"The awakening of private and commercial interests to the value of the aeroplane is almost upon us, and with the awakening we shall have an immense increase in business. The relations of the manufacturers to the public, however, must be conservative in finance, design and construction.

"In closing, let us speak a good word for the aeronautical press, which has struggled along through many lean years, carefully fostering interest in things aeronautic and powerfully aiding in the development of the industry upon broad gauge lines."

Mr. A. H. Doolittle, Adv. and Sales Manager, The Zenith Carburetor Co.:

"The Aerial Age is received and read with a great deal of interest because it covers most thoroughly the new developments in the aeroplane field.

"Many of your items regarding records and tests are of particular interest to us through the large use of our product upon aeroplanes and their motors built in this country.

"Wishing you every success in promoting the good work, etc."

Mr. B. D. Foulois, Captain Aviation, S. C., Commanding First Aero Squadron:

"I note with pleasure that the Aerial Age is approaching its first birthday, and I desire to congratulate the magazine on its success. Aviation is making wonderful progress in the world today, and publications like this one are beneficial factors in collecting and disseminating information tending toward success in this, the most important field today.

"We have added Aerial Age to the list of publications subscribed for by the First Aero Squadron, and many of the officers and enlisted men of the squadron personally subscribe for it. I know that it will be as great a pleasure to the members of the squadron during the coming year as it will be to me.

"With best wishes from the First Aero Squadron."

The News of the Week

The Irony of It

Four headlines in the newspapers within the last few days tell us the tale of American unpreparedness with telling force. Two headlines running almost parallel read, "French Airman Brings Down His Eighth German Aeroplane"—"Entire U. S. Aero Squadron Consisting of Eight Aeroplanes To Go To Mexico." And two other headlines read, "12,000 U. S. Troops Ready for Mexican Expedition," and on the same page of the same paper, "Carranza Orders 25,000 Troops to the Border."

Comment is unnecessary.

Plans for the World's Largest Seaplane

Raymond V. Norris, Western representative of the Curtiss Aeroplane Company, recently announced in San Diego, where he is an instructor in the Military School of Aviation, that Glenn H. Curtiss was outlining plans for the largest aerial superdreadnought in the world, a triplane seaplane with a wing spread of 266 feet, equipped with a battery of ten 200-horsepower motors.

The engines of the new aerial war craft will be coupled in twin units of 400 horsepower each, driving five twenty-foot air propellers. In addition to this motor battery the seaplane will be fitted with a 160-horsepower motor fitted to a water propeller as a means of driving the craft to her moorings after alighting.

The seaplane will carry a crew of 20 men, will carry 6,000 pounds of bombs, in addition to a battery of four rapid-fire guns, and will be able to fly 1,000 miles without alighting to replenish the fuel tanks.

As soon as the Curtiss Company completes the building and shipment of twenty huge war triplanes now under construction at Buffalo for the British Royal Flying Corps, the construction of the seaplane will be begun.

The flotilla of twenty triplanes now under construction for Great Britain will be equipped with five-inch rapid fire non-recoil guns, the invention of Commander Cleland Davis, U. S. N., and will be used in attacking German seacoast towns in retaliation for the Zeppelin raids on England.

Artists Will Work for National Defense

One of the most interesting meetings in behalf of adequate national defense that has been held was that which was called to order in the Aero Club of America, on Saturday evening, March 11th, where a large number of prominent artists and cartoonists assembled by invitation. Recognizing that the artist and the cartoonist wield a tremendous influence on the public mind, the meeting was called to mobilize this talent in behalf of the movement against war. It was held that in arousing public sentiment, in calling into activity the latent patriotism of newspaper and magazine readers, these gentlemen can render an exceedingly valuable public service.

Among the leading artists who were present were James Montgomery Flagg, E. M. Ashe, W. K. Starrett, and W. Allen Rogers.

Henry A. Wise Wood, Chairman of the Conference Committee on National Preparedness made the opening address, and he was followed by Alan R. Hawley, President of the Aero Club; Henry Woodhouse, Henry Reuterdahl, and Commander R. K. Crank, in charge of all the Navy recruiting stations west of the Rocky Mountains; Raymond B. Price, Commander E. P. Fitzgerald, Second Battalion N. Y. Naval Militia.

The purpose of the plan was to secure from master artists patriotic pictures which will first be reproduced in leading current publications and later copies will be distributed and posted in all parts of the country. Especial emphasis is to be given to the distribution in small places. There are, for instance, over 70,000 stores in hamlets in the United States, which stores are the common center for the people of that community, and in these places stirring posters should be especially useful, since the circulation of the general mediums is likely to be limited in such districts. In Great Britain remarkable results have followed the use of the Brangwyn and Pryse posters appealing to the men of the kingdom and the colonies to protect their homes. Mr. Reuterdahl, the marine artist, directed the attention of the artists to the splendid work that had been done for the British government by a single poster, which, at a glance, drove the whole subject of national defense home to every one. It went directly to the heart of the subject more effectively than either literature or oratory could do.

In the needful work of crystallizing public sentiment on national defense in the United States there is similar opportunity for artists here. Incidentally, Mr. Reuterdahl told his audience of the dearth of works of art on Army and Navy life and character in America. He said that it was almost impossible to find them along Fifth avenue. It was the consensus of opinion that the time was ripe to replace the beautiful feminine pictures with which the publications now abound, both within and on the covers, with illustrations portraying the virile character of American manhood, with national defense as the basic thought.

The posters and illustrations made in this way are to be at the disposal of the national defense societies generally, and are also to be reproduced in book form.

Among those who attended the meeting were Perry Belmont, Cortlandt F. Bishop, S. Stanwood Menken, Mr. and Mrs. Sigmund McHie, Mrs. Henry A. Wise Wood, Mrs. Lindon Wallace Bates, Chairman of the Woman's Section of the Movement for National Preparedness; Mrs. Raymond B. Price, W. Redmond Cross, Dr. John E. Haussmann, Evert Janson Wendell, J. Stuart Blackton, and Captain H. G. Montgomery, N. G. N. Y.

In co-operating with the artists, the Aero Club of America will arrange to give any of the participating craft that may desire the experience aeroplane flights, for it is recognized that now and henceforth the work of the artist requires a knowledge of the aeroplane and the thrill of the flight.

Wants to Fly from Augusta, Ga., to New York

Mr. H. S. Rinehart, manager of the Wright Aviation School at Augusta, Ga., has written to General Manager A. R. Knabenshue, of the Wright Co. of New York, asking for the company's consent to a flight from Augusta to the metropolis.

The Wright Company's flying school at Augusta will close its winter session about May 1st. Mr. Rinehart desires at the close of the session to fly North in the high-powered Wright machine which was recently brought to Augusta. It is a 6-cylinder machine, 150 horsepower and a minimum speed of 70 miles an hour.

The distance between Augusta and New York via the Southern Railway is 787 miles and this distance can be shortened in an aeroplane flight. Mr. Rinehart plans to leave Augusta at 5 o'clock in the morning and reach New York in the afternoon between 4 and 5 o'clock, landing at Governor's Island. He plans to make no descent whatever between Augusta and New York and to set a world's record of continuous flight from city to city. Mr. Rinehart expects to go from Augusta to Columbia, thence to Chester, S. C., up through North Carolina and to Petersburg, Va., Washington, Baltimore, Philadelphia and New York.

The Philadelphia School of Aviation

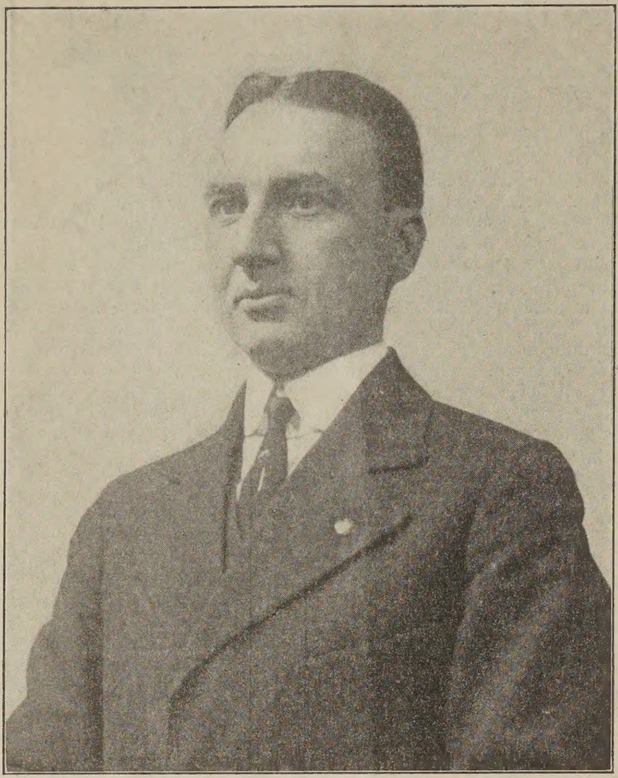
The municipal authorities of Philadelphia have entered into a lease whereby for the nominal rent of $1 a year the Philadelphia School of Aviation, an institution of patriotic purposes, will have the use of "The Orchard" at Essington, a suburb, for ten years. This disposes of the last preliminary and the promoters having in hand the necessary funds with which to make a beginning, the work of the school will soon be actually under way.

Thomas Aviation School

There are at present fifteen students enrolled at the Thomas Aviation School at St. Augustine, Florida. The climatic conditions have been so favorable that Instructor C. Ray Benedict reports excellent progress in both the land and water branches of the school. The students at present hard at work are: Allen Wilson, Montreal; J. H. Morrow, Toronto; Thomas Sheader, Toronto; Alfred Pelton, Montreal; William Carter, Calgary; L. Smith, Toronto; Kirby Whitsett, Kansas City; Ronald Kurstead, Toronto; Dan Probst, Englewood; Geo. Peck, Montreal; Ted D. Koiff, Montreal; Thomas Shearer, Toronto, and George Smith.

New Headquarters for Ripolin Paint.

The J. A. & W. Bird Co., distributors of Ripolin Enamel Paint, have changed the location of their offices from 66 Beaver street, to the Equitable Building, 120 Broadway.



Mr. Frederick C. Chananhouse, who has been made superintendent in charge of the designing department, Sturtevant Aeroplane Co.

Salt Lake City a Difficult Place to Fly

Terah T. Maroney, the aviator, has lately been in Salt Lake City in consultation with the officials of the Utah State Fair for a repetition of the exhibitions that he gave there last fall.

A local newspaper quotes Mr. Maroney as saying that outside of Evanston, Wyo., where it is most difficult of all places in the country to fly, Salt Lake ranks as next most difficult. The rarity of mountain atmosphere, and the ever-changing air currents render flights in this altitude extremely dangerous, he says.

It was in Salt Lake that Mr. Maroney determined to become an aviator. While watching the flights of Glenn Curtiss here in 1911 he sought Curtiss out and arranged to attend the aviation school in California.

Buffalo Aviation Corps

Clad in the regulation khaki of cavalrymen, the members of Buffalo aviation corps, first formed in connection with any National Guard or militia organization and furthest advanced in the United States, presents a primly military appearance at weekly drills in the 65th Infantry Armory. Though but 45 men comprise an aero squadron, according to army regulations, nearly twice that number of young men have been training for the past eight weeks. Those who survive will be the fittest—in attendance at drills, study and physically.

Lieut.-Col. J. D. Howland, 65th Infantry, N. Y. N. G., is in temporary command. Owing to the uncertainty of regular and militia authorities as to the proper procedure of organizing an aero squadron in connection with the National Guard, and the status of its members, it may be several months before the formalities in connection with mustering in are completed. In due time the Buffalo men will likely organize as an aviation corps of the signal corps of the State of New York.

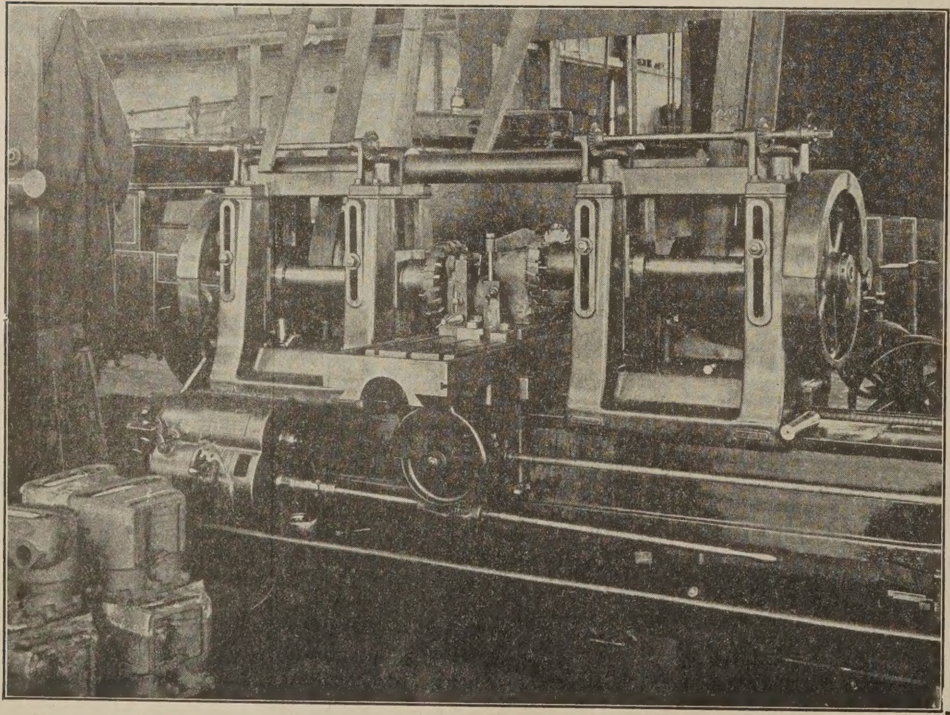
The efforts of the Military Aviation Corporation of Buffalo have made this progress possible, with the co-operation of the 65th Infantry officers. Recognizing that there are at present less than 20 aeroplanes in the United States Army and Navy together, and while the new national defence program contemplates adding the inadequate number of about 75 more, there is little prospect of getting any assistance from the National Guard in this branch of national defense; a number of prominent Buffalonians are financing the squadron.

The aviation corporation is to buy aeroplanes and supplies required by the aero squadron, and pay for flying courses of its members at a special school to be conducted by the Curtiss Aeroplane Company, which will assure competent instruction and save considerable breakage expense. The members are now learning the school of the soldier and school of the squad; signalling with flags, wireless and searchlights; and map reading, making, locating and sketching.

The theoretical training also will include construction of aeroplanes and motors; meteorology, atmospheric changes, winds and clouds; elementary tactics; pistol and machine gun practice, and use of instruments. Early in May it is expected work out of doors will begin and the practical work of flying taught.

The Curtiss Aeroplane Company has already acquired property located just north of the Buffalo city line on Niagara Falls Boulevard for a flying field to be used exclusively by the aero corps members, and a hangar has been erected.

The officers of the Military Aviation Corporation are: John M. Satterfield, president; Howard A. Foreman, vice-president; Seymour P. White, treasurer, and Langdon B. Wood, secretary. Mr. Satterfield is president of the Aero Club of Buffalo. The following are directors: Glenn H. Curtiss, Howard A. Foreman, William R. Huntley, H. A. Meldrum, H. K. Root, J. M. Satterfield, Ralph Sidway, Seymour P. White, Langdon B. Wood and George P. Urban.



Milling top and bottom of Thomas Aeromotor cylinder at one operation on a double spindle horizontal miller. Valve port and water pipe flanges and back of cylinder pair are also faced off in one operation. This machine takes care of forty cylinder castings a day.

New Registering Altitude Barometer

Henry J. Green, of 1911 Bedford avenue, Brooklyn, has just completed the manufacture of an aviation altitude barometer that promises to be of the utmost utility. The firm has had wide experience in the construction and requirements of such instruments, having calibrated many imported barographs for members of the Aero Club of America, and also tested and repaired many for meteorological purposes. The instrument is made as light as can be, consistent with durability, being constructed of aluminum as far as possible, having a weight of only one and a half pounds. Its dimensions are 6½ inches long, 4¼ inches wide and 5 inches high. The chart is graduated in inches with altitude in feet. The clock movement makes one revolution of the chart drum in six or twenty-four hours.

Features of the Ashmusen Motor

During eight years of experimenting and testing, the Ashmusen motors successfully flew Wright Twin-Screw, Curtiss type, Ashmusen testing and Heinrich Military Biplanes, Stephens Flying-boat and Bleriot, Dep., Wiegandts, Antonelli's and Schmitt's Monoplanes. Besides that hundreds of block and break horsepower tests have been made of ten hours' continuous full-load runs in all kinds of weather, and without covering. Government officials and other prominent men have witnessed some of these lengthy tests. It has often been noted that there is less than 10 r.p.m. variation from hour to hour.

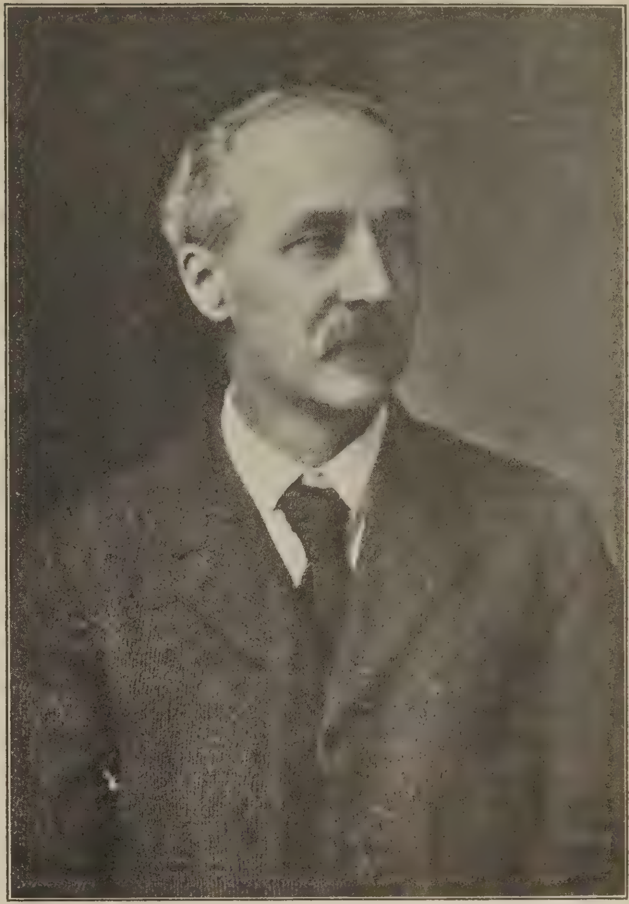
The eight-cylinder size shows test of 72 actual break horsepower at 900 r.p.m. on propeller shaft, 1,800 r.p.m. on crankshaft, and the 12-cylinder size have been tested up to 2,600 r.p.m. on propeller shaft, showing 133 h.p., although they are recommended only for 1,800 r.p.m., at which they give 108 h.p.

In these engines there are no rights and lefts, all cylinders, heads, pistons, connecting-rods, valves and springs, etc., are interchangeable to any part of either engine. The engines can be set to turn in either direction and are equally adaptable for pusher, tractor or chain-drive machines. It is not necessary to remove the engine from plane for examination. It can be taken apart for examination of cylinders, pistons, bearings, crankcase, heads and valves in 20 minutes and assemble in 25 minutes. Another efficiency feature is that there are no oil or grease cups—just pour oil in the tank and the motor will take care of itself.

No radiators nor water jackets, pipes, pumps, or water manifolds are necessary. There is no water to freeze in winter, nor boil in summer, and no fans or blowers are necessary, as each cylinder has a number of air flutes or channels suitably disposed, through which the air travels to the carburetor. This system cools the cylinders equally, keeping them round, and heats the entering gas to a very economical and more positive explosive than if it was cold. It also permits of the use of very low grade of gasoline and even kerosene.

No vibration is apparent in the Ashmusen. Self-starters can easily be attached or priming system with push button starting, or hand-crank.

Ashmusen drawings are all finished to the smallest detail; the dies for drop-forgings, patterns for castings and special manufacturing tools are completed and brought up to date. The Ashmusen Company manufactures these aeronautical power plants and nothing else, and the company is now in position to deliver engines in quantities.



Godfrey L. Cabot, who is leading the movement for increased aviation strength in New England.

Naval Aeroplane Demolished in a Collision

The United States Naval Aeroplane A-H-10, attached to the Naval Aeronautical Station at Pensacola, Florida, was demolished in a collision with a schooner off Mobile a few days ago. In co-operation with the battleship Arkansas and New York the A-H-10 had been sent to Mobile to participate in manoeuvers in connection with the Mardi Gras exercises. The wrecked plane was of the Burgess-Dunne seaplane type, and was equipped with appartus for dropping explosive bombs. Lieutenant Edward O. McDonnell, U. S. N., who was piloting the machine, escaped without serious injury.

Students at the Thomas Aviation School at St. Augustine, Florida. Seated in the machine, Alfred Pelton, Montreal. Standing, left to right: Dan Probst, Englewood; G. Peck, Montreal; William Carter, Calgary; Allen Wilson, Montreal. Seated, left to right: C. Ray Benedict, instructor; Ted De Koiff, Thomas Shearer and Geo. Smith, Montreal.

The Glenn L. Martin Model "S" Seaplane, equipped with the Hall-Scott motor, in flight over Los Angeles Bay.

General Aeroplane Co. of Detroit

The General Aeroplane Company, of Detroit, Mich., has perfected a new machine, one of the new designs has been assembled at the company's factory and will be tried out in the very near future. The company has nearly ready for assembling an armored seaplane of the pusher type. This plane goes to fill an order.

Alfred V. Verville, formerly with the Curtiss Company, is the designer for the General Aeroplane Company. Jay D. Smith, who is employed by the company, will shortly leave to do some exhibition flying in Florida. The General Aeroplane Company is looking forward to a busy summer in school and passenger carrying work. Eventually the company expects to commence to manufacture aeroplanes on a commercial basis.

Detroit Naval Reserve

The Detroit Naval Reserve has plans for the establishment of an aerial corps.

First Aeroplane Made in Jacksonville, Fla.

The Baysdorfer-Kuhl Aeroplane Company, whose offices are in Chicago, have recently completed the building of an aeroplane at Jacksonville, Fla. All the material used in the construction of the machine was purchased in Jacksonville, and the aeroplane has been named "Miss Jax." It was especially constructed for looping stunts, and will be flown by Karl T. Kuhl. His business associate, Charles R. Baysdorfer, is a licensed aeroplane pilot. Messrs. Baysdorfer and Kuhl have announced their intention to start an aviation school at Pablo Beach, where they will make daily flights.

Maximotor News

Very few in aviation perhaps know that the Maximotor does not confine its activities entirely to this field. The reputation it enjoys has extended beyond the aeronautical circle and is responsible for its being used in other fields where a light-weight high-powered motor can be used to advantage.

About three years ago, to fill a demand then existing for light-weight high-speed motors for marine use, a number of Maximotors were fitted with reverse gears and sold for this purpose. Their success was so pronounced that the Maximotor Company definitely decided to enter this field, their product becoming an important factor in marine racing circles. Their enormous power and light weight stand them in good stead in such service.

A number of well-known speed boats and hydroaeroplanes have been equipped with Maximotors, including the Zip, winner of the Oakland County cup at Sylvan Lake, Michigan, last season. Their success in the racing field, which has been phenomenal, has resulted in a number of orders already being received for racing motors for the coming season, including one from a Detroit sportsman for one of their high-powered motors for use in a hydroplane to compete in the Gold Cup Race, which will be held in Detroit next September. While the motor ordered will not be as powerful as some of the motors entering this race, it is believed that the extreme light weight and reliability of the Maximotor will more than offset the difference in the power of the motors.

Ice boating is also in the line of Maximotor activities. Last year Mr. Edward Russell, of Detroit, purchased a four-cylinder 50 h.p. Maximotor for use in an ice boat of his own design. With this motor he was able to obtain a speed of better than 70 miles an hour, defeating everything on the ice in any shape or form, from an automobile to a sail boat. His enthusiasm at the results received was so great that he constructed a new boat this season, which he undoubtedly can claim to be the fastest motor-driven ice boat in America, if not the world. It has a speed of over 100 miles per hour, due largely to the enormous power of the 120 h.p. Maximotor with which it is equipped.

The motor used by Mr. Russell in his present ice boat is an eight-cylinder V-type 120 h.p. motor. It is identical with the one used by Aviator O. E. Williams with such good success all last season in exhibition work. Similar models have been delivered to the General Aeroplane Company, H. W. Waters Company, Jannus Brothers and others. The Maximotor Company also reports having a number of orders for motors of this type on their books for future delivery.

Photograph of Thomas D-2 type military tractor, taken before its speed trials, which resulted in a new American record of ninety-five miles an hour. The compact Thomas 135 H.P. Aeromotor, with which this machine is equipped, makes possible a very neat installation. Attention is called to the single exhaust pipe, which is in the path of the down draft from the descending propeller blade, sweeping the exhaust gases under the fuselage and away from the pilot and passenger.

Aeroplane Factory in Long Island City.

The L. W. F. Engineering Company has leased 30,000 square feet of space in the Russell Loft Building, Long Island City, and is installing machinery to manufacture aeroplanes. About 100 hands will be employed. The company was recently incorporated under the laws of New York by Charles F. Willard, of New York City; Edwin Lowe, Jr., and Robert G. Fowler, of San Francisco. Mr. Willard is an aeronautic engineer and designer, and Mr. Fowler made the transcontinental flight in an aeroplane in 1912.

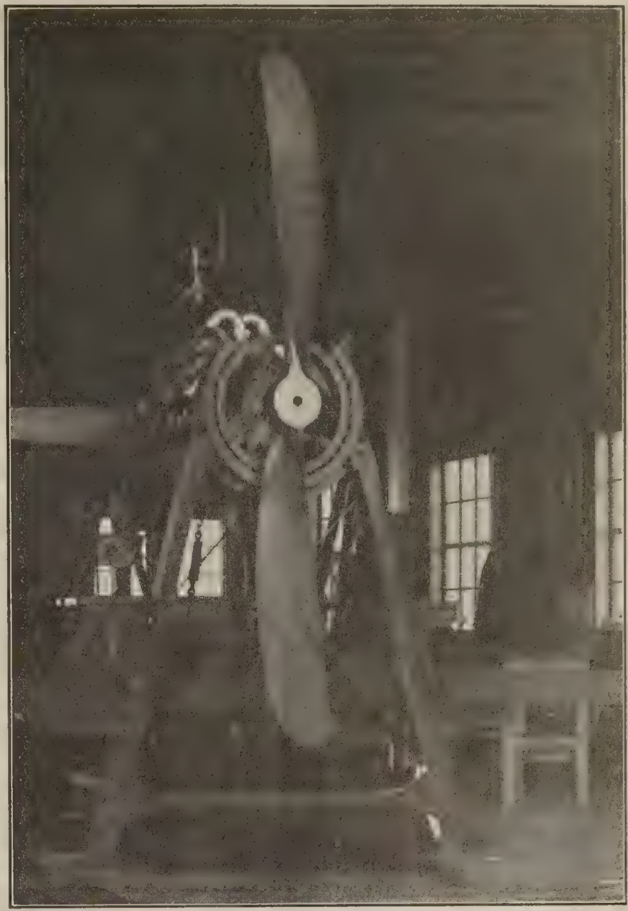
Aeronautics and Their Effect on the Gauge Makers' Art

The original invention of Bourdon upon which was based the entire gauge industry of the various countries has been utilized in the production of pressure registering devices for all purposes.

Until the advent of the automobile these gauges were more or less of a standard for certain set purposes with all the different manufacturers. The automobile. however, introduced entirely new features, making necessary the production of new materials and structure of the mechanism. Under the old conditions the simplest form of gauge was the ordinary tube bent in the form of a half circle, which, under internal pressure, tended to assume a straight line, this motion being utilized to operate a movement which in turn caused the hand to rotate. This form of gauge was all right for stationary work, but the long unstaid service presented by the tube itself was very susceptible to vibratory conditions. The next step to overcome this was to shorten the tube and to apply an auxiliary spring to the end of it, which tended to reduce the amplitude of the vibration of the unstaid end. This, however, was found inadequate for locomotive work, and the final step to overcome vibration was taken in the production of the locomotive gauge, which is a double tube device built with very short tubes and a lever mechanism designed to accomplish the necessary rotation of the hand by the very slight motion of the short tubes.

In the production of the automobile gauge we were confronted by these new conditions: Serious vibration conditions of high frequency, together with accurate registration at very low pressures, and a movement contained in an exceptionally small case. The very low pressures made necessary the use of a different tube than had ever before been produced of exceptionally thin walls and consequently very susceptible to vibration. This was successfully overcome by a tube bent on a very small circle, thereby securing the necessary motion without seriously yielding to vibration. Also the transition from the ordinary cast cases to the pressed cases permitted a greater accuracy than before attained, as well as affording a greater production.

Lastly, the aeroplane has made a more serious demand on the gauge industry than ever before encountered. The vibration conditions of the automobile have been exceeded by those of the aeroplane. Since the revolutions of an aeroplane motor are far higher than those of an automobile engine, we therefore have a vibration of very high frequency. Accuracy features are even more important for the aeroplane than they are for the automobile. In addition to these, we are working with a mechanism not designed to run on firm earth but in the air, and called upon to alight on almost any kind of ground under most adverse conditions. The gauge, therefore, must be so designed that it will withstand the severe shocks due to an unfortunate landing.



An eight-cylinder 140 H.P. Sturtevant aeroplane motor mounted upon a special dynamometer testing stand ready for a propeller test. The construction of the dynamometer is such that the conditions which an engine would actually undergo in an aeroplane while in flight, have been very closely approximated.

The gauges used on aeroplanes are, therefore, a still further development in materials, workmanship and efficiency over those produced for the automobile trade, and the best proof that the American manufacturers have been able to meet these new conditions is furnished in the report of one company manufacturing for a large percentage of the American aeroplane builders, who states that to date, after a year's service on various aircraft, their percentage of returned gauges for any cause is a fraction of one per cent.

Ball Bearings for Aeroplanes

THE success with which ball bearings are being used in aeroplane construction is due largely to the fact that, when correctly designed and manufactured, they are absolutely reliable. Reliability is the most important quality of every part used in an aeroplane; ease of repair or replacement offers but slight consolation to the aviator whose machine has fallen two or three thousand feet.

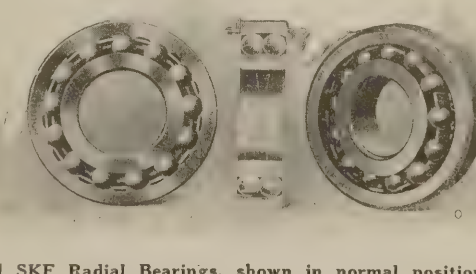
To fully appreciate the reliability and usefulness of ball bearings, their mechanical construction and the material from which they are made should be carefully considered. A radial bearing of the type manufactured by the SKF Ball Bearing Company, New York City, consists of an outer ball race, an inner race, two rows of balls and a ball retainer or spacer. The balls and races are accurately made of highly-tempered Swedish crucible steel, a material admirably qualified to resist wear. The ball spacer, of pressed steel, or bronze (depending upon the type of bearing in which it is used), is made in one piece; there are no screws or rivets to work loose and interfere with the proper action of the bearing.

Reliability is, however, but one of the valuable qualities which ball bearings of the self-aligning type possess. In the inner race of the bearing, definite paths for the balls are formed by grinding two grooves in the outer surface. No definite path is provided for the balls in the outer race; the surface on which they roll is ground so as to form part of a sphere, the center of which always lies on the axis of the shaft. It will be seen that the bearing is really an adaptation of the "ball and socket" principle, although the shaft may deflect, the strain on the bearing is not increased. This cannot be said of any other type of bearing.

Automatically aligning bearings are invaluable in the aeroplane, because of the necessarily flexible nature of the construction of these machines. Although made of the lightest possible materials, aeroplanes are frequently subjected to severe shocks and stresses, which tend to distort the frame. This distortion throws the bearings out of alignment, possibly even causing the moving shafts to spring slightly. The result of this disalignment in ordinary bearings is to cause cramping and binding; but in SKF Ball Bearings the self-aligning feature automatically adjusts itself to all movements of the shaft. Thus they are able to operate satisfactorily under conditions which would soon render useless a bearing incapable of automatically following the movements of the shaft on which it is mounted.

Next in importance to reliability perhaps comes lightness; that is, the weight per horsepower should be as low as possible. A ball bearing is much more compact and much lighter than the plain bearing which it replaces; in addition, it saves at least three-fourths of the power usually wasted by the babbitt or bronze bearing. Thus, at the same time that the weight and size of the machine are reduced, the amount of available power is increased.

For use on propeller shafts a double thrust bearing is provided. This bearing is capable of accepting thrust in two directions, and, like the radial bearing, is self-aligning.



Typical SKF Radial Bearings, shown in normal position, in section, and in deflected position.

GOING FORTH TO MEET THE EAGLE

WINGS for the Packard Twin Six! Ever since it was first loosed upon the highways it has been trying to fly. There are owners who insist that it does fly—that it leaps right up from a good smooth roadway, and touches gently only now and then to make sure the pavement is still there. But that is not exactly—pretty near it, but not exactly—like climbing way up into the welkin, far into the rare air, whence come the gentle raindrops and incendiary bombs.

And the Twin Six for wings. The announcement in that form is what is of more interest to the aero world. And it has shown itself to be much interested. Following another orgie of night work in the engineering department, a notice was sent out from the office of F. F. Beall, vice-president of manufacturing of the Packard Company, on January 5, as follows:

"A new department has been created and will be known as the Aero Motor Department, symbol 'Y,' location fifth floor building No. 1. George N. Baker has been appointed foreman."

Clifton H. Cook

Before the system clerks could stow this *bon mot* in the volume entitled "Instructions on Routine," various executives had both hands full of queries about why and when and where. Jesse G. Vincent has explained it all. There are two whys. One is to establish the supremacy of the twelve-cylinder motor, and to take advantage of the adaptability of that motor to aeroplane usage. The other is a patriotic motive.

The government of the United States is admittedly so far behind Europe in the matter of aero equipment for the army and navy, that it has become necessary for private companies to take an active interest in this important phase of military preparedness, President Joy and the Packard directors believe.

The automobile manufacturer, being informed about engines of the internal combustion type, and having facilities for quantity production, is best equipped to engage in the building of power plants for aeroplanes. And the twelve-cylinder motor, by reason of the fact that it eliminates vibration—a serious matter in aeroplane construction—and because of its advanced design, light, compact form, and its ability to operate at high speed for a great length of time without stopping, is recognized abroad as the best type of motor for aeroplane use.

J. G. Vincent, who is vice-president of engineering, has devoted a great deal of time to making tests and investigations. He advanced the belief, based on sound experience, that the best motor for the military aeroplane is a twelve-cylinder, 200-hp. engine. Where greater power is required, for battle planes, batteries of motors are used successfully. Groups of motors are now being used to propel enormous machines recently developed in Europe for use in the Great War.

Besides establishing the aeromotor department at the factory, Mr. Joy has purchased a tract of land bordering on Lake St. Clair for an aviation field and landing place. This field is to be used for a training school conducted by the Aero Club of America, and probably will be designated on War Department maps as an official landing place.

The plot is nearly a mile square. It is to be cleared, equipped as a supply and repair station, with suitable hangars, club-house, and a lodging place for touring air-men. The field is part of several farms, and is bordered on one side by the Clinton river. It is only a short distance from Mount Clemens.

An experimental biplane for testing out Packard motors will be delivered at the field within a few weeks. It is the Sloane tractor type.

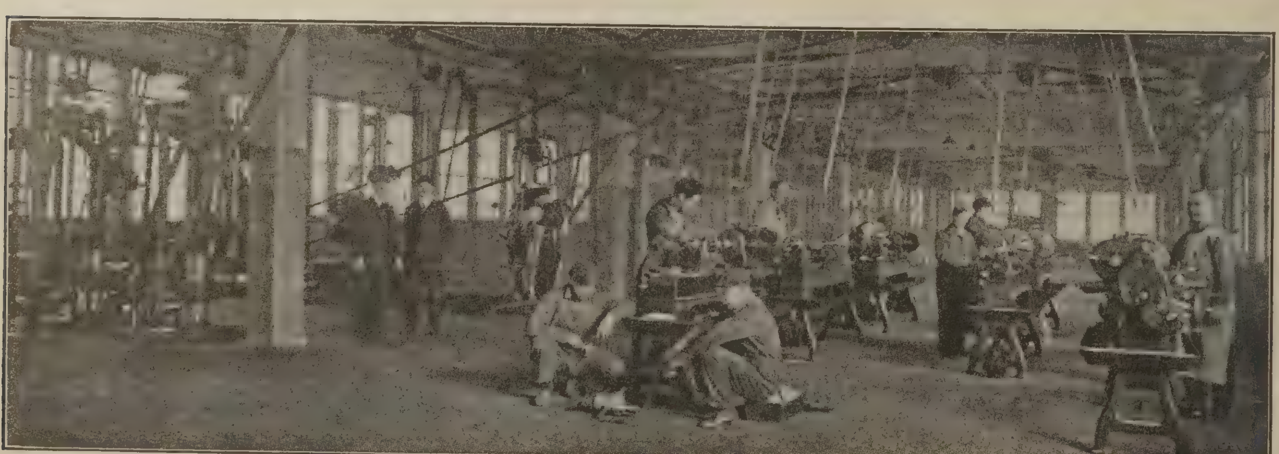
"Mile-a-Minute" McCulla has come back from the very foremost edge of the front in France, having cavorted about the jaws of death long enough to keep him quiet for a time, and has joined Vincent's staff. What with specializing in speed for a number of years, mixing up in wars, and getting chummy with battle-planes, M.-a-M. Mac has fitted himself for researching. And that's what he will do in connection with the development of air-craft motors.

Clifton H. Cook, who brought some fame to himself as an aviator when only seventeen years old, is now employed at the factory, familiarizing himself with Packard motors.

Machine tools are being installed as rapidly as possible in the new department. Vincent is reticent about the details of the aero motor. He says it is much like the Twin Six, except that it has a larger displacement, and has been lightened to the greatest degree possible without sacrificing stamina.

Predictions are coming fast these days. Some of the aeronautical seers say that mail will be carried by aeroplane between New York and Chicago and other points. It is said that much fretting has been done by wealthy sportsmen in America who have gone in for aeroplaning, because the war has cut off the supply of machines.

There is reason to think that aero touring will be placed on a practical basis before long Carl Fisher, president of the Indianapolis Speedway Association and originator of the Lincoln Highway Association, has started a movement to have landing places established throughout the country.



This room is being fitted up exclusively for the manufacture of Twin Six aircraft motors

ACTIVITIES OF STURTEVANT AEROPLANE COMPANY

IT has been announced recently by the Sturtevant Aeroplane Company that Mr. George Armitage of Providence has been made the engineer of design in charge of the designing department, and Mr. Fred C. Chanonhouse has become the superintendent in charge of the manufacturing department. The organization of the Sturtevant Aeroplane Company, of which Mr. Noble Foss is president and Mr. Grover C. Loening is vice-president and general manager, has become established on a very firm basis and is beginning to assume the aspect of humming business.

In the Jamaica Plain aeroplane factory, which has over 30,000 square feet of floor space and is well equipped with the latest kind of machinery, a departmental system has been installed. One of the most important branches of the work, the designing and engineering department, is established with a corps of experts and every feature of designing of Sturtevant aeroplanes is given a most thorough and effective study prior to construction.

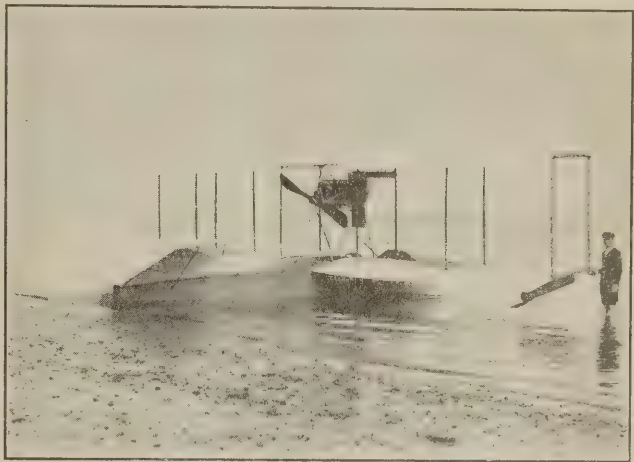
George Armitage in one of his early monoplanes

The manner in which the designs are completely detailed, furnishing the shop with checked blue prints of even the smallest item of construction, is eminently satisfactory.

In connection with the design work, exhaustive tests are made in the stability moments, lift and drift of each new type of machine, in the Massachusetts Institute of Technology.

Mr. George Armitage, who is in charge of the work, started in aeronautics in 1905, built a Lillienthal glider, on which forty flights were made, and later a 3½-hp. De Dion motor was installed. In 1908 he began experimenting with monoplanes, and in 1909 he built a small machine that weighed 240 pounds, with 16-hp. motor. Fifty-seven flights were made with this machine with satisfactory results, and in 1911 a larger monoplane, shown in the photograph, was built and flown by Mr. Armitage. In 1912 and 1913 he experimented with a Bleriot 50-hp. machine, and later designed the flying boat, built by B. Stevens & Sons of Providence, which was flown in 1915.

In addition to this Mr. Armitage has flown many times as passenger and has had extensive experience in machine designing with Taft-Pierce Mfg. Co. and the Narragansett Machine Company.



Flying boat built by Fred Chanonhouse at Squantum, Mass., in 1914

Mr. Chanonhouse, the superintendent of the Sturtevant Aeroplane Company, became connected with the B. F. Sturtevant Company in January, 1912, in the gas engine department, was associated with the designing and construction work there, and filled the position of inspector and foreman of this department. Later he took charge of the testing of all Sturtevant motors.

In several years of experimenting with aeroplanes, which began when he learned to fly the first Herring-Burgess machine with Sturtevant motor, Mr. Chanonhouse has built a number of different types of machines for private use.

As the representative of the B. F. Sturtevant Company he recently visited the principal aviation centers in England and France, becoming familiar with the many different types of war machines, in course of construction and in flight, and the tendency toward future developments.

In addition to Messrs. Chanonhouse and Armitage, Aviators Roy Waite and Harry M. Jones are on the staff of the Sturtevant Aeroplane Company.

The Sturtevant All-Steel Battleplane, equipped with 140 H.P. Sturtevant motor

SIX MONTHS RECORD OF HALL-SCOTT MOTORS

DURING the past six months the Hall-Scott aeronautical motor has shown up excellently amongst the best of American motors. It has smashed three world's records and two American records. The world's records include: January 12, 1916—Altitude with pilot and one passenger in hydroaeroplane, 12,362 feet in 1 hour 40 minutes; February 11, 1916—Altitude with pilot and two passengers in hydroaeroplane, 9,544 feet in 1 hour 55 minutes; February 15, 1916—Altitude with pilot and three passengers in hydroaeroplane, 9,603 feet in 2 hours (flat). The records were made by Floyd Smith, operator for the Glenn L. Martin Company, of Los Angeles, in Martin Model "S" seaplanes purchased by the United States Army to form part of the equipment of the First Aero Squadron for the Philippines.

The American records broken included: August 30, 1915—Altitude with pilot and one passenger in hydroaeroplane, 7,400 feet in 1 hour 40 minutes; August 31, 1915—Los Angeles to San Diego and return, with pilot and passenger, in hydroaeroplane, cross country, non-stop, 230 miles, in 3 hours 20 minutes, actual flying time. Both flights were made by Lieut. H. ter Poorten of the Netherlands Government Flying Corps in Martin Model "TT" seaplane.

On February 19, 1916, the Hall Scott motor enabled Corporal Edward Smith, in Martin Model "S," to create an endurance record for pilot and passenger in a hydroaeroplane, by making a flight of 8 hours and 40 minutes.

The Sloane military tractor, which recently made a splendid official test for the British Government, was equipped with the Hall Scott A-5. The duration of the trial was 1 hour 27 seconds. The climb was 3,000 feet in 7 minutes 27 seconds, mean speed obtained over those runs up and down a measured mile, 84.7 m.p.h. During the trials the machine carried 40 gallons of gasoline, 4 gallons of oil, and pilot and passenger —315 pounds.

On August 12, 1915, an endurance run was made on the Hall Scott factory test stand, with tractor propeller 8 feet 10 inches diameter by 6 feet pitch directly connected, under the supervision of Hildreth & Company, well-known New York Inspection Engineers, with following results:

The motor was started at 8:20 A. M. at 900 to 1,000 r.p.m. and allowed to warm up gradually for ten minutes, when the throttle was opened wide and the engine ran at full speed, varying in turns from 1,250 to 1,300 plus r.p.m., according as the wind varied from time to time. The motor operated very successfully and continuously, from 8:20 A. M. to 4:30 P. M., making a continuous run of eight (8) hours and ten (10) minutes, and when slowed down showed no indication of overheating in any part.

On the morning of the 13th, the same motor was remounted in the factory cradle type, torque frame stand, and a ten-minute run made with the same propeller used in the endurance test. The motor went up immediately to full 1,300 r.p.m., with brake resistance of 115 lbs., with a brake arm 63½ inches long, and at 1,325 r.p.m., 118 lbs., with a thrust of 600 lbs., and 620 lbs., respectively, using a Warner Magnetic Tachometer, calibrated to 2,000 turns, and a spring balance to weigh thrust.

The propeller was then dismounted and the motor started with a short club made fast to the crank shaft for starting purposes, the throttle pulled wide open, and the tachometer indicated from 500-800 plus on the second turn. It was estimated that the actual revolutions made were over 3,000 r.p.m. This speed was held for 20-30 seconds. The engine was then drained of water and oil and immediately stripped in the presence of inspectors. All parts of the motor were found in perfect condition, except one broken top piston ring in No. 2 cylinder.

Water temperature did not exceed 140 degrees.

Gasoline consumption, per h.p. hour, .448 lbs.

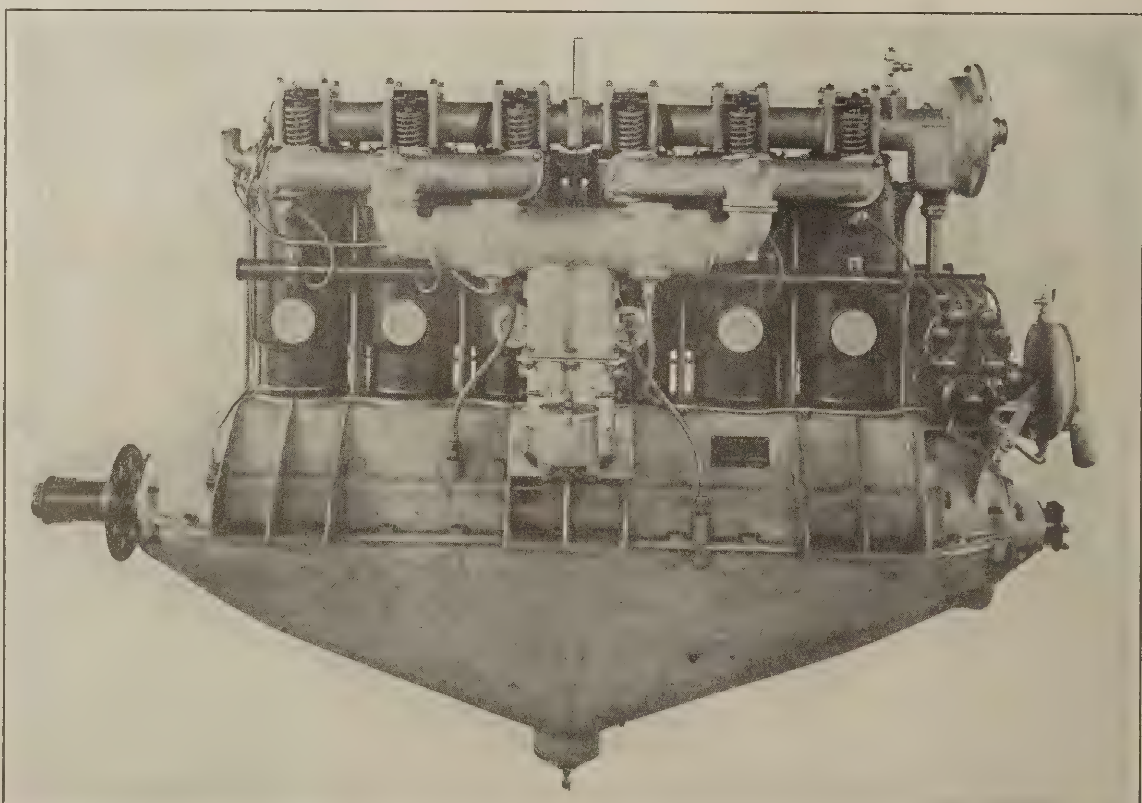
Oil consumption, per h.p. hour, .0019 gallons.

Idling speed with warm engine, 200 to 250 r.p.m.

Gravity of gasoline used in test, 0.730 specific gravity, or 62.5 Baume.

Lubricating oil used was (Standard Oil Co.) Mobile "A."

A power and endurance test on the electric dynamometer stand at the Automobile Club of America, New York City, was made with one of the A-5 engines, in November, 1915. Two separate runs of two hours each, duration, were made, and then the engine was run for fourteen (14) hours, continuous duration, with wide open throttle. These runs were made with muffler attached, the style of muffler used pulling down the power delivery considerably. The average h.p. delivery for the run was 130.



Intake side of the new six-cylinder Hall-Scott. Notice arrangement of the double-jet Zenith carburetor and the intake manifold, which is both oil and water jacketed. Provision is made for supplying warm air to the carburetor

THE ATLANTIC COAST AERONAUTICAL SITUATION

EARLY in January of this year the Curtiss Aeroplane Company selected Newport News, Va., as its winter headquarters for experimental work and the training of students. At that time an arrangement was made with the Atlantic Coast Aeronautical Station, a private company incorporated to carry on experimental work, to enable the Curtiss Company to use their equipment.

Newport News has quickly become an aviation center. There are six J. N. land machines of 90 h.p.; two Model 3, 160 h.p., of the type that Victor Carlstrom flew from Toronto to New York City a short time ago, and six Model F, 90 h.p. Curtiss flying boats.

Very many natural or established conditions operated in favor of the selection of Newport News for the location of this important branch of the Curtiss work. First, the weather conditions are decidedly favorable. Its location on Hampton Roads gives a great expanse of quiet waters for experimental work and student flying. The great shipyards there make it a rendezvous for many men skilled in the mechanical sciences, and the city is within easy reach of both Washington and New York, as well as within flying distance of Florida.


School Activities.

Much experimental work has already been carried out, and it will be at this branch of the Curtiss Company that the monster triplane flying boat will be given its initial air tests. As we have already stated in these columns, this aerial dreadnought will have a wing spread of 137 feet, and will be equipped with motors totalling one thousand horsepower.

Mr. Henry Woodhouse, Governor of the Aero Club, in describing this boat the other day, said:

"The size of this new flying yacht was most impressing and once more the wonder of the conquest of the air by man made me marvel. Ten years ago we—only very few of us—marvelled at the thought of the possibility of flying with an heavier than air machine. The majority of people laughed at our belief and called us 'dreamers.' Then the Wrights, Santos-Dumont, and other pioneers, made their first flights, and the world stood in wonderment, marvelling at the achievement of what had been pronounced as impossible by all—including scientists.

"After that one achievement succeeded the other, and, particularly after 1912, when the nations began to spend millions in developing aeronautics, aviation developed in rapid strides.

"Marine flying only started in 1911 when Glenn H. Curtiss made the first flight ever made with a hydroaeroplane. A year later Curtiss developed the first flying boat, and in 1914 he developed the large flying boat 'America,' which was ordered by Rodman Wanamaker for the transatlantic flight—which could not be made on account of the war.

"These things came to my mind as I looked at the twenty - passenger yacht being completed in a factory near Buffalo, about which nothing has been published at date of writing, the matter being kept secret."

The illustration below shows markedly the more than ordinarily satisfactory conditions for both land and water schooling.

Eventually there will be facilities at the Newport News training school for 500 pupils, with not more than four or five students to each machine.

The land and water schools are operated together, and all machines are equipped with either the Dep or the Curtiss controls, as the pupils desire.


The Atlantic Coast Aeronautical Station at Newport News, as seen from one of the school flying boats.

REPORTS ON WIND TUNNEL EXPERIMENTS IN AERODYNAMICS

I. The Wind Tunnel of the Massachusetts Institute of Technology

By J. C. HUNSAKER
Assistant Naval Constructor, U. S. Navy
Instructor in Aeronautics, Massachusetts Institute of Technology

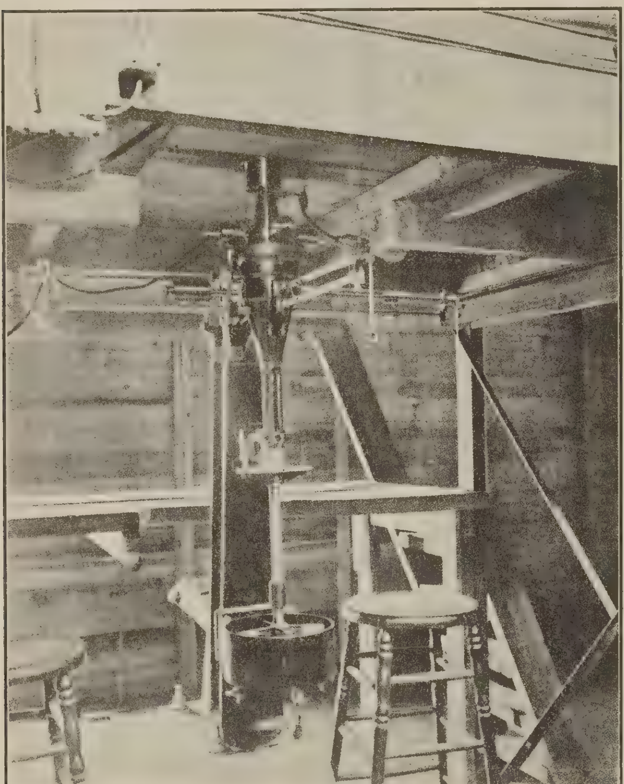
(*Continued from page* 597, *Vol.* 2)

Aerodynamical Balance

The aerodynamical balance (pl. 3) was constructed by the Cambridge Scientific Instrument Company, England, to the plans and patterns of the National Physical Laboratory. The balance is described in detail by Mr. L. Bairstow in the Technical Report of the Advisory Committee for Aeronautics, London, 1912-13. For details of operation and the precision of measurements reference may be made to the original article.

In general, the balance consists of three arms mutually at right angles representing the axes of co-ordinates in space about and along which couples and forces are to be measured. The model is mounted on the upper end of the vertical arm which projects through an oil seal in the bottom of the tunnel.

The entire balance rests on a steel point, bearing in a steel cone. The point is supported on a cast-iron standard secured



Aerodynamical Balance

to a concrete pillar, which in turn rests on a large concrete slab. The balance is then quite free from vibration of the floor, building or tunnel.

The balance is normally free to rock about its pivot in any direction. When wind blows against the model, the components of the force exerted are measured by determining what weights must be hung on the two horizontal arms to held the model in position. Likewise the balance is free to rotate about a vertical axis through the pivot. The moment producing this rotation is balanced by a calibrated wire with graduated torsion head.

Force in the vertical axis is measured by means of a fourth arm. The model for this measurement is mounted on a vertical rod which slides freely on rollers inside the main vertical arm of the balance. The lower end of this rod rests on one end of a horizontal arm having a knife edge and sliding weight.

For special work on moments, the interior vertical rod is replaced by another having a small bell crank device on its head which converts a moment about the center of the model into a vertical force to be measured as above (pl. 4).

In this way provision is made for the precise measurement of the three forces and the three couples which the wind may impress on any model held in any unsymmetrical position to the wind.

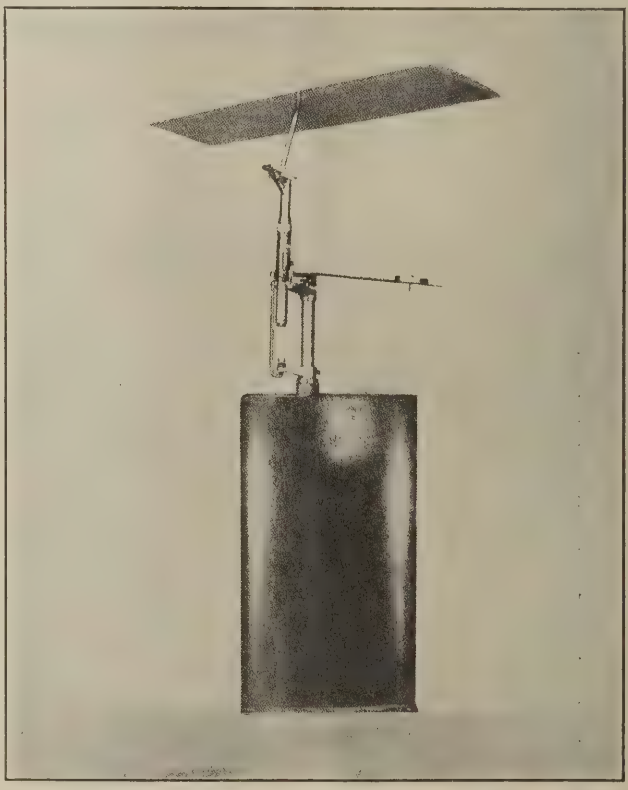
The balance is fitted with suitable oil dash pots to damp oscillations, and devices for limiting the degrees of freedom to simplify tests in which only one or two quantities are to be measured. The balance can be adjusted to tilt for 1/10,000 pound force on the model. In general, the precision of measurements is not so good as the sensitivity, and in the end is limited by the steadiness of the wind and the skill of the observer.

The weights and dimensions of the balance were verified by the National Physical Laboratory, where also the torsion wires were calibrated.

For ordinary forces, weighings may be considered correct to 0.5 per cent. Naturally for very small forces, such as the rolling moment caused by a small angle of yaw, the measurements cannot be so precise.

Alignment of Tunnel

The axis of the wind tunnel was desired to be horizontal from the honeycomb to the baffle plates in front of the propeller. To accomplish this an engineer's level was mounted on a platform, built on the floor of the house, opposite the



Model wing mounted in wind tunnel on moment device of balance

mouth of the tunnel, and sighted on the intersection of diagonal threads placed at 6-foot intervals. By this means the distance of the center line of the tunnel above or below the horizontal line could be estimated to one-eighth of 1 inch.

The tunnel being low in the center, it was raised by wedges until the reference marks coincided with the horizontal. This was attained to within one-eighth of 1 inch in 6 feet of tun-

nel length. The tunnel may, therefore, be said to have its axis horizontal to within one-tenth degree.

Alignment of Vertical Axes of Balance

A concrete foundation having been built for the balance, the latter was set in its appoximate position. Three wedges were then inserted under the base-plate of the balance standard, and the whole balance raised to its proper height. It was now necessary to rectify the vertical axes of the balance.

To bring the axis of the balance more nearly vertical by more sensitive means the following method was employed: The small torsion wire, used in aerodynamical measurements with the balance, was set in place. The lower pivot of the balance was engaged in its bearing, leaving the balance free to rotate about its vertical axis, but constrained from tipping laterally.

The torsion wire was adjusted by means of the micrometer head until the cross-hair on the fixed telescope coincided with that on the mirror attached to the balance proper.

A weight of 0.4 pound was placed on one balance arm. The micrometer head was again turned until the cross-hairs were coincident. By setting up on the holding-down bolts, the balance axis was adjusted until placing a weight on either of the arms required no further rotation of the torsion head to maintain coincidence of the cross-hairs. In such a case the axis of the balance is vertical. The final adjustment admits of a possible error of less than 1/400 inch-pound on the torsion wire. The angularity of the balance axis remaining uncorrected may be computed as follows:

Let

$F =$ force hung on arm.

$\beta =$ angle of balance axis to vertical.

Then, taking moments about the vertical axis

$$F \sin\beta \times 18'' = 0.4 \times \sin\beta \times 18'' = 1/400$$
$$\text{or } \beta = 0.^\circ 025.$$

Determination of Wind Direction in the Horizontal Plane

As a first approximation, the wind was assumed parallel to the axis of the tunnel. A vertical flat plate was mounted on the balance arm and carefully set parallel to a line drawn on the floor of the tunnel in the direction of its axis. The plate was inclined 8 degrees to right and left of this position, and the transverse force measured on the balance. The observations were repeated for 6 degrees and for a second plate to eliminate errors due to irregularities in the plates. The transverse force on on side was greater than on the other, indicating an error in the assumed wind direction. A new line was drawn on the tunnel floor, making an angle of 0.3 degrees with the original line. The observations for transverse force were repeated. It was then found that the average of transverse force readings taken for equal angles to right and left of mid-position differed 0.5 per cent from the mean of all readings. The extreme error of one observation, including the error of 0.5 per cent, due to lack of sensitivity of the balance and the personal error of the observer, may then be as great as 1 per cent in case the two errors are cumulative.

It is not considered practicable to obtain a closer setting with the methods of alignment employed.

Setting Arms of Balance

Knowing the true direction of the wind, it is necessary to set the horizontal arms of the balance parallel and perpendicular to this direction. To do this the floating part of the balance was rotated by an adjustment provided by the design until the force recorded on the "drift" arm (the resistance) was equal for equal angles of the plate to right and left of the wind direction. The final setting indicates a remaining error of .2 per cent.

After making the slight adjustment required here the error in the transverse force measurement was not found to be increased.

Measurement of Air Velocity

The velocity of flow in the wind tunnel is measured by a pressure tube anemometer commonly called a double Pitot tube.

Our laboratory standard is a double Pitot tube presented by the director of the National Physical Laboratory, England. This tube was compared with the National Physical Laboratory standard, which had been calibrated on a whirling arm by F. H. Bramwell.[1] Its constant had been determined to be unity to a precision of 0.1 per cent. Our tube was compared with it by a method allowing a precision of 0.25 per cent. A discrepancy of about 0.25 per cent was found. Its readings may then be taken as correct to this degree of precision. In all cases a uniform rectilinear current is implied.

The Pitot tube, in common with all anemometers, has the disadvantage of obstructing the channel, and where models are to be tested the channel should be kept entirely clear. The expedient of using a side hole in the channel is due to M. Eiffel.[2]

In a channel of uniform section, air is forced to flow practically parallel to the axis of the channel. Hence stream lines are all parallel, and across any section, taken normal to the channel axis, there should be no component of velocity at any point. This statement is of course true only for a steady, uniform flow free from turbulence. The static pressure should be constant across a section, for if pressure differences existed there would be a transverse flow of air created. Tests in our wind tunnel showed constant pressure across a section to a good approximation. Incidentally the constancy of this static pressure across a section is a measure of the uniformity of flow.[1]

A small hole in the side of the tunnel can then be used to measure the static pressure, but the dynamic pressure measured by the impact end of the Pitot tube is

$$p + \frac{\rho v^2}{2g} = p_0, \text{ by Bernoulli's equation,}$$

where

$p =$ pressure at any point in a stream line.

$v =$ velocity at any point in a stream line.

$\rho =$ density at any point in a stream line.

$p_0 =$ pressure where v is zero.

In our wind tunnel a fan sucks air through the tunnel, which is therefore all under suction. The air is discharged by the fan through a strainer into the building at one end, whence it returns at low velocity to the other end to pass again into the tunnel. At a point in the room the pressure transmitted by an impact tube would be

$$p_r + \frac{\rho v_r^2}{2g} = p_0.$$

But the room is 30 times as large as the section of the tunnel, and when a wind of 30 miles is blowing in the tunnel, there is only a gentle draft in the room of about 1 mile per hour. Thus the ratio $\frac{v_r^2}{v^2} = \frac{1}{900}$ and the pressure in the room can be taken as

$$p_r = p_0 = p + \frac{\rho v^2}{2g}$$

neglecting v_r^2.

If then we connect a hole in the side of the tunnel with one end of a liquid manometer, and leave the other end open to the room, the gage reading is proportional to the difference in pressure or to

$$p_r - p = p_0 - p = \frac{\rho v^2}{2g}.$$

The reading of the manometer thus is a measure of the velocity.

Due to loss of head from friction in the mouth of the tunnel and in the honeycomb, the relation

$$p_r = p + \frac{\rho v^2}{2g}$$

is not strictly true. An unknown loss in friction would be represented by adding a term to indicate the friction head pressure. Then

$$p_r = p + \frac{\rho v^2}{2g} + p_f.$$

The use of the side plate method ignores the effect of p_f. A comparative test showed an error of 3 per cent when velocity was calculated from side plate readings. It is, therefore, necessary to calibrate the side plate and its manometer against the standard Pitot tube and its manometer.

The side plate used (fig. 1) consists of a thin brass disk about 3 inches in diameter set flush in the wall of the tunnel. The disk is flat and highly polished. Near its center, five holes 0.02 inch in diameter are drilled. These holes are connected with a brass tube soldered to the back of the plate and projecting through the side of the channel. Rubber tubing is used to transmit the static pressure from the small holes to one end of a manometer. As explained above, the other end of the manometer is open to the air in the room.

The pressures transmitted by the side plate have been found to respond very quickly to changes in velocity, and the method is even more sensitive than the Pitot tube. Naturally its precision is no better than that of the Pitot used for its calibration.

The pressure difference transmitted by the side plate is read on an inclined alcohol manometer on the Krell principle. Both the side plate and this alcohol manometer require calibration against a standard. For convenience, the side plate and its manometer were calibrated together against the standard Pitot tube and a Chattock manometer.

(To be continued.)

NEW GENERAL AERONAUTIC ENGINE

The General Aeronautic Company, of which Mr. R. K. Mickey is President, at 110 West 40th street, New York, has recently placed on the market an aeronautical motor. In conversation with a representative of Aerial Age, the other day, Mr. R. R. Grant, chief engineer of the company, said:

"It is agreed by engineers and physicists that the only way to perfectly balance a reciprocating part in any machine is by means of a second reciprocating part of equal weight, which moves at all parts of its path with exactly the same velocity as the first weight at that instant, but in the opposite direction.

"It is evident that in the V-type of engine, the reciprocating parts do not move in opposite directions, but at an angle, usually of 60° or 90°.

"It has long been a matter of debate, both in the V-type and in the vertical cylinder type of engine, in aeroplane work, as well as in automobile work, as to how the reciprocating masses should be balanced (or partially balanced). The most advanced practice is apparently to balance, by means of counter-weights, the weight of the crank pins and one-half the weight of the connecting rod. In an engine recently adopted for a well-known make of automobile, and which is said to give 80 per cent. more power than one of the same piston displacement used the previous year, it is claimed that most of this additional power is gained by using a new system of counter-weighting the crankshaft.

"It is true that vibration, aside from its other objections—which are great in aeroplane work—also causes a greater loss of power than is commonly supposed. This loss of power is due partly to the work done in keeping up the vibration in the structure to which the engine is attached, and partly to the excessive friction in the bearings. It has been found in the case of engines mounted on trucks for agricultural purposes that fully one-half the power may be wasted by vibration.

"The principle used in the automobile engine above mentioned was to entirely neglect the effect of the reciprocating parts, and to balance the revolving parts alone. It is evident there still must be considerable vibration due to the reciprocating parts when at high speeds, as the effect of the inertia of these parts increases as the square of the speed.

"In the opposed type of engine, where the cylinders are 180° from each other, instead of 60° or 90°, it is possible to balance not only the revolving masses, but also the reciprocating masses, and both of these ends are accomplished without the use of heavy counter-weights, which are, of course, especially objectionable in the aeronautical motor.

"All that is necessary in this design is to have the cranks in pairs, so that each one is balanced by one next to it on the opposite side of the shaft. The perfect balance thus obtained is probably the chief reason for the form of curve obtained in a test on the General Aeronautic Company's new motor.

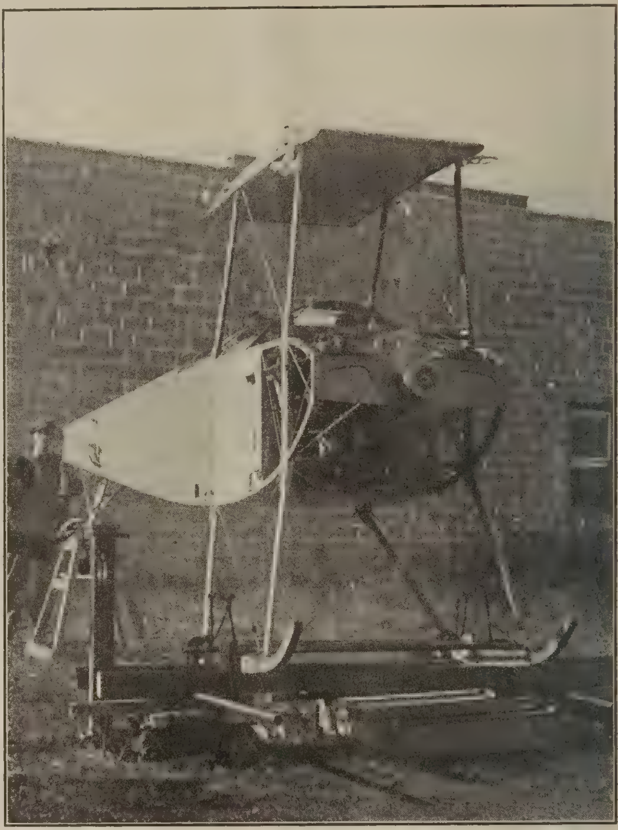
"It will be noticed that the power increases directly as the speed, or, in other words, the torque does not fall off as the speed increases, which shows that the friction and vibration losses do not increase with speed, as in engines of the vertical or of the V-type. Both theory and practice show that in aeroplane work, as soon as the torque falls off the engine "lies down," so that an engine can be used only up to the point where the torque begins to decrease. The speed of most aeroplane engines is limited in this way.

"A further advantage of this design is that it is especially adaptable to high-powered units running at high speed, in which the propeller is run at a lower speed. Since the axes of all the cylinders are in the same plane, the unit requires but little head room, and two units may be placed one over the other and still require no more head room than the ordinary engine. When high power is required, two engines are assembled into one compact unit in this manner, both being geared to the propeller shaft, the axis of which extended lies midway between the two crankshafts.

"On account of the many difficulties found in using the magneto at the high speeds and in the adverse atmospheric conditions of aeroplane work, a battery ignition system is used. A special storage battery has been developed for this purpose after extensive laboratory work, which has a capacity of 25 ampere hours and weighs less than 10 lbs. As the ignition system requires only from .1 to .2 ampere when running under normal conditions, one charge of the battery will last at least 125 hours. The system is absolutely unaffected by moisture and water may be thrown directly on it without injury. The spark is automatically controlled by a centrifugal action, so that the maximum efficiency is gained at all speeds.

"A venturi tube carbureter is used which makes it possible to control the speed entirely by the throttle.

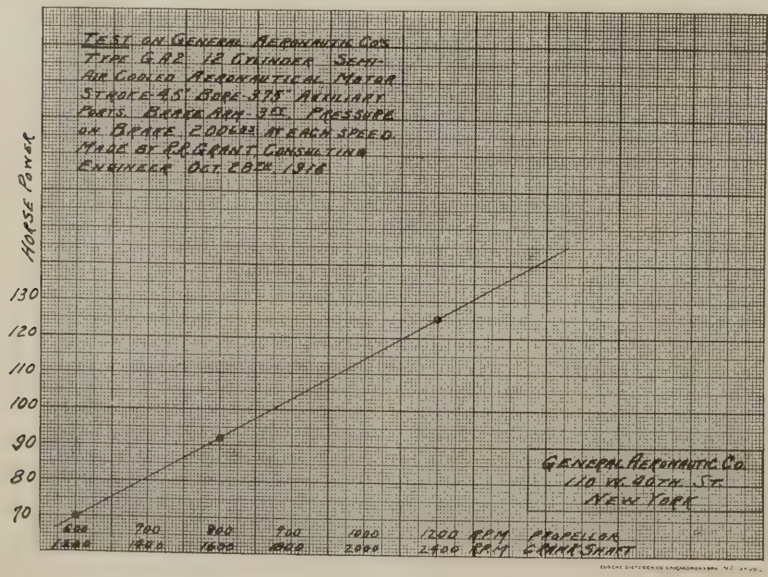
"The engine is semi-air-cooled, *i. e.*, the heads are water-cooled and the cylinder walls are air-cooled. In this way use is made of the natural aptitude for air-cooling which the aeroplane has in passing through the



air at high speed and the cylinders are run at a higher temperature than with water-cooling, which increases the economy of the engine and at the same time the weight of the cooling water and radiators, etc., is considerably decreased. The water-cooling of the heads prevents any over-heating of the valves and consequent troubles. The heads include the clearance or combustion space and therefore absorb the greater part of the heat, which has to be taken from the cylinders by a cooling medium. The cooling water is driven by a duplex pump with a thermostatic device, which keeps the water in the cylinder heads always near the boiling point, thus preventing waste of heat when the air is cold, due either to the season or high altitude, or when the motor is not working at its maximum capacity.

"The oiling system is of the pressure type direct to the main bearings.

"Other specifications are as follows: 3¾ cu. in. piston displacement per h.p., .5 lbs. fuel per h.p. hour, 1 gal. oil per hour (ordinary automobile oil is used). Weight of power plant, complete, per h.p.—4 lbs. All principal bearings are ball bearings."



Power curve of the new General Aeronautic Type GA2, 12-cylinder, semi-air cooled aeronautical motor.

FOREIGN NEWS

By JAMES E. CLARK

BELGIUM

On two succeeding days six French aeroplanes raided the railway lines over which the Germans have been transporting military supplies in Central Belgium. They dropped many bombs and caused extensive damage.

FRANCE

A feeling of indignation toward the Swiss has been aroused in Paris because two Swiss Colonels who were accused of supplying military information to the Germans have been acquitted by the courts of their own country. The indignation has been increased by the publication of a long letter from Aviator Eugene Gilbert, who is interned in Switzerland. He escaped last Summer but was ordered returned.

On March 8 French airmen delivered a number of attacks, most of them over the lines of the enemy. During one of these engagements at Eriennes fifteen German airmen were forced to flee. Later ten of them were seen to be descending vertically in the direction of their own lines.

In addition, two German aviators, one in a Fokker machine, were overcome in the Champagne district, and three others were vanquished in the region of Verdun. The machines of the five aviators came to the ground within the German lines.

The Paris Journal warns its readers to be prepared for the return of Zeppelins at any time, except when the weather is very bad or there is bright moonlight. The new L-Z type, of 32,000 cubic meters capacity, it says, is far more powerful than the earlier models, and can rise higher and maintain its equilibrium in a high wind, enabling it to face almost any weather. Its average altitude, it is said, is between 2,000 and 3,000 meters (6,000 to 9,000 yards), so that it can keep above the clouds.

One hundred and twenty-four shells of all calibres were dropped on the Metz-Sablons railway station a few days ago by a squadron of sixteen French aeroplanes. Several trains were drawn up ready for departure where the missiles began to rain down. "The projectiles found their mark" is the only statement that the war office makes as to the amount of damage done. A German aeroplane squadron tried to give chase to the French machines, but all returned safely to their base with the exception of one, which was forced to land as the result of a motor failure.

GERMANY

A German fleet of fifty or more warships, some of them of enormous size, has been reported to be cruising in the North Sea with two great Zeppelins leading the way and watching against a surprise attack from the British fleet. When this fleet was last seen it was 165 miles due west of the mouth of the Elbe. During the recent air raids on England one Zeppelin was seen guarding three cruisers, a number of destroyers and submarines, which were credited with the intention of making a dash to English waters. The Zeppelin scouts, however, discovered the watchfulness of the English fleet and the German squadron hastily withdrew.

An official announcement by the Headquarters Staff gives a review of the aerial operators during the previous month.

"In the month of February," says the report, "the activity of our air units, as regards attacks and the number of their far-reaching reconnoitering nocturnal squadron expeditions behind the enemy front, was considerably greater than before. The following schedule not only again proves our superiority, but also refutes the assertion, beloved by our opponents, that our losses in aerial warfare are so small because our aeroplanes do not dare to fly over enemy lines.

"German losses on the western front during the month of February amount to none in aerial battle, none by being shot from the ground, six missing; total, six. The French and British have lost thirteen in aerial battles, five by being shot from earth, three by forced landing within our lines; total, twenty-one.

"It must be observed that we have based our figures only on machines which have fallen into our hands or which have been observed to fall in flames, and not on numerous other machines shot down behind the enemy lines."

On March 10, German aviators shot down two British aeroplanes—namely, one monoplane near Wytschaete, south of Ypres, and one biplane to the northest of La Bassée. The occupant of the first aeroplane was dead.

According to semi-official newspaper lists published in France and in England twenty-five Zeppelins have been destroyed since the beginning of the war. The list of these casualties follows:

August 19, 1914—Three wrecked in Belgium.
August 30—The Z-8 wrecked near Badonviller.
September 5—One captured by the Russians near Seradz.
December 30—One destroyed by the British at Cuxhaven.
January 27, 1915—The Z-19 lost near Libau.
February 9—One lost in a storm in the North Sea.
February 17—The L-4 burned near Nordby, Denmark.
February 18—The L-3, which took part in the raid on Norfolk, England, lost in a snowstorm in Denmark.
March 2—One wrecked in a storm at Cologne.
March 8—The L-8 broken in two near Tirlemont, and one lost in a fog off Calais on the same day.
March 14—One brought to earth by Ally aeroplanes in Belgium.
April 14—One wrecked near Thielt.
June 7—One destroyed by Lieutenant Warneford.
June 12—One destroyed by bombardment at Evere, near Brussels.
July 8—One exploded in a hangar at Brussels.
September 9—One wrecked by explosion near Stoekel.
October 13—One wrecked by explosion at Poix-St. Hubert.
November 15—One burned at Grodno.
January 30, 1916—The Zeppelin, which flew over Paris, damaged by anti-aircraft guns and compelled to fly low, on returning was wrecked by collision with houses near Ath, Belgium.
January 31—The L-19 lost in the North Sea.

GREAT BRITAIN

The German air raid on Sunday, March 12, was not a success. A German seaplane was sighted approaching North Foreland about noon. British aeroplanes went up from Dover with the intention of engaging it in combat but the enemy refused the challenge, wheeled about and flew seaward.

Lord Northcliffe, writing of the marvels of the Verdun battle, declares that the Allies excel in the air.

"While I was at Verdun the weather was too misty to enable me to witness the air fights with the latest types of machines, but I had seen a number of air duels on previous occasions, and every time the German cleared out when he faced British or French aviators, lest, so run official German excuses, he lose the machine and with it the machine's secret.

"There is no secret in recent German aeroplanes or the aeroplanes of either side. The war has merely developed horsepower, which means climbing power. A few weeks ago the German Fokker rose to notoriety. Today it is being outengined by Moranesaulnier and Nieuport and the newest type of English aeroplane."

Thirty-one aeroplanes of the Allies made a raid recently against a railway station and barracks at Carbin and did considerable damage. All of the raiders returned to the base.

As the result of an air fight one German machine and one machine of the Allies were brought down near Tournal.

Five of the persons reported as injured in the recent Zeppelin raid over England have since died. The revised statement of casualties is as follows: Killed, nine men, four women and five children; injured, twenty-two men, twenty-two women and eight children. Messages received from newspaper correspondents in Kent assert that one of the Zeppelins that took part in the raid was damaged by anti-aircraft guns. One message declares that a Zeppelin which passed over the Kentish coast homeward bound early on the morning after the raid was seen to be in difficulty. Another despatch says it is reported that an explosion took place on board the Zeppelin when it was hit and this partly crippled it. A broken portion of a Zeppelin propeller has been found in Kent.

After having been defeated in the recent widely advertised bye-election in the Mile-End district for a seat in the House of Commons, Pemberton Billing, who resigned from the Royal Naval Air Service to stand for Parliament on the issue of better protection against Zeppelin raids, has been elected member for East Hertfordshire by a majority of 1,051 over the coalition candidate, Brodie Henderson. Mr. Billing made a denunciation of Great Britain's alleged inefficiency in air service the basis of both his campaigns.

A surgical operation in midair—the first that has been reported in the history of the world—is revealed in a statement from the British headquarters.

Lieutenant S—— and Captain C. D—— were being chased by a German aeroplane commanded by Lieutenant Immelmann, who opened fire on the Englishmen with his machine gun and pierced their gasoline tank with his first shot. The British aeroplane began to descend in a volplane, and the German fired again wounding the captain in the right arm and smashing two of his fingers. While the captain steered with his left hand, Lieutenant S—— amputated the two fingers. The airmen came down to safety, but as they had no more gasoline in their tank they were unable to set fire to their machine, which fell into the hands of the Germans.

JAPAN

An order has recently been placed at the Koishikawa Arsenal by Russia for the manufacture of ten aeroplane motors. The authorities have accepted it, it is understood, although recently an order for 300 planes from Petrograd was declined by them owing to the limited productive capacity of the Arsenal.

Some twenty motors, all of 70 h.p. type, have been manufactured by the Koishikawa Arsenal for the Army Air Service. Since the outbreak of the European war, the staff members of the Arsenal have been working to produce a more efficient engine. Their labor has recently been rewarded by the successful manufacture of a 100 h.p. motor. It will shortly be tried at Tokorozawa Aerodrome.

A new waterplane with a 200 h.p. motor has been added to the Navy Flying Corps. It has been manufactured by the Naval Arsenal at Nagaura entirely with Japanese materials. Flight-Lieut. Inouye, of the Navy, has tried the gliding power of the new machine at Oppama successfully and he is expected shortly to make a flight on it.

In observance of the anniversary of the founding of the Empire, and also in celebration of the anniversary of a magazine Juichi Sakamoto, an aviator, was to have made some flights at Tokio, on Feb. 11. In this connection the Nikoniko Club advertised for women candidates who would go up on an aerial excursion with Mr. Sakamoto. The Club received 30 applications. Six of them were accepted, and they will be absolutely the first women to go up in the air in Japan. Their ages range from 20 to 24, and they are all daughters of respectable people. The event is expected to start in this country a new vogue of flight for women, but in trying out the engines on the appointed day the engines suddenly stopped at a height of 100 metres and the machine fell into a tree and was wrecked. The first flight of women in Japan was therefore postponed. The aviator escaped without injury.

SWITZERLAND

A German deserter who had been employed at the Friedrichshafen has arrived in Switzerland. He had been employed for six months in the Zeppelin works. He declares that it takes from three to four weeks to complete a Zeppelin and that the statement that two Zeppelins a week can be turned out from any factory is not true.

According to this man the recent explosion at the Skoda works, near Prague, was a great blow to the Zeppelin factory, as the greater part of the aluminum skeleton and motors was made there. A new factory has been established in Budapest for this purpose. The most expert engineers and workmen at Friedrichshafen have been killed in raids, and the war staff now consists chiefly of wounded soldiers. The staff numbers 2,000, of whom a quarter are useless for military service.

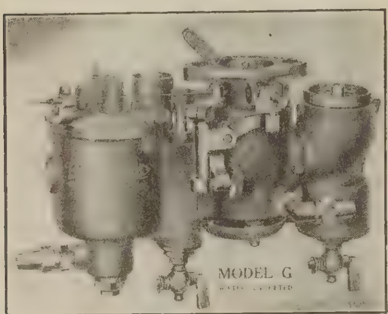
ACCESSORIES

Ferdinand Glues

The glues supplied by the L. W. Ferdinand & Co., 201 South street Boston, are used almost exclusively by constructors of flying boats in this country. They recommend for this purpose especially their Quality C, and No. 7 black, white and yellow soft quality marine glue. All these materials are used for waterproofing canvas coverings of flying boats; they not only waterproof and preserve the canvas but attach it to the wood and with a coat of paint once a year will last as long as the boat.

Rayfield Carburetors

Because of the lower quality of fuel in common use today and the demand for greater flexibility and economy, the new Rayfield carburetor was designed



by the Findeisen & Kropf Manufacturing Co., 21st and Rockwell streets, Chicago. Today a successful carburetor must give maximum power and speed, permit a fast smooth getaway from any speed, handle all grades of gasoline, idle the motor perfectly, start the motor easily, be simple of adjustment and stay adjusted, be quickly adaptable to all makes and sizes of motors, and in addition it must be economical. The Rayfield is used as standard equipment on many high grade cars, and in the aeronautical field the success which the daring aeronaut Art Smith has had with his Rayfield is testimony enough to its efficiency.

"Norma" Ball Bearings

A peculiar interest attaches to the "NORMA" Ball Bearing, as being one of those products which the European

war has proved can be made as well in America as abroad. Prior to the war, the "NORMA" Bearing was an imported product—the factory being at Cannstatt, Germany, and the Norma Company of America being simply the United States sales organization.

With the shutting off of imports, however, the American Company at once started to equip a factory of its own and, before its stock of imported bearings was exhausted, began to produce American-made "NORMA" Bearings in every way equal to the German product. Since that time the Company has been steadily increasing its facilities, but today its output is still far behind the demand for these high-precision bearings.

The "NORMA" Ball Bearing is pre-eminently a high-speed bearing, its speed qualities being the result of several distinctive features, among which are: open-type, separable construction; rigid mounting of both races; very light ball cage; polar guiding of balls; extremely high precision and superior finish; selected materials specially treated.

Its recognized speed qualities have largely determined the principal field of application of the "NORMA" Bearing in America, which may be defined as that in which silent, vibrationless running at high speeds is the prime essential.

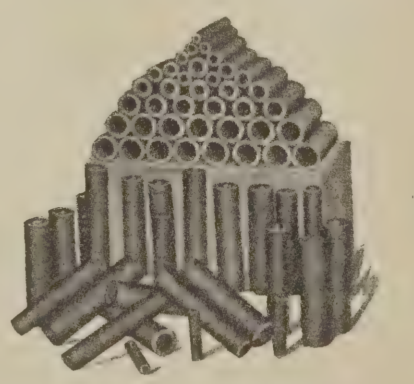
This is exactly the service demanded in the bearings of ignition apparatus, lighting generators and starting motors for automobiles, motorcycles, motor trucks, motor boats and aeroplanes.

And it is a significant commentary upon the service-giving qualities of "NORMA" Ball Bearings that they are today the standard bearings in probably 85 per cent of the electrical ignition, lighting and starting apparatus made in America.

The "NORMA" line, however, is not limited to these small ball bearings. It includes also ball bearings in all standard sizes, roller bearings, thrust bearings, combined annular and ball thrust bearings, and combined roller and ball thrust bearings. All are distinguished by the characteristic "NORMA" high precision, silence, and service-giving capacity.

The Cramp Special Bearing Bronze

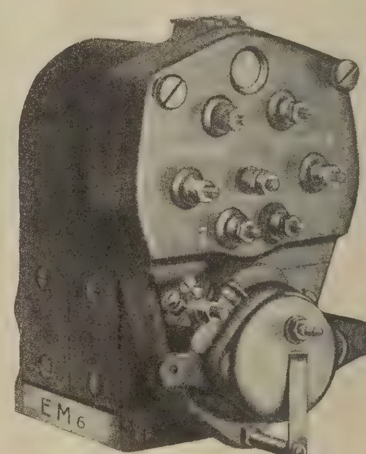
The William Cramp & Sons Ship and Engine Building Co., of Philadelphia, are in a position to supply special bearing bronze for aeroplane motors bushing castings and brass and bronze cast-



ings requiring strength. The bearing bronze is the hardest bearing bronze manufactured. It has anti-friction qualities equal to those of any bronze, has the highest elastic limit under compression of any bronze used for bearing purposes and is more durable than any other bearing bronze. It should be used in all cases where a hard bronze is required if the manufacturer of the machine in which the bearings are to be used is desirous of doing a high class work. This metal has an elastic limit under compression of from 20,000 to 25,000 lbs. per square inch and a sclerescope hardness of No. 30.

The Eisemann Magneto

Although the Eisemann Magneto is so efficient and reliable, that a large number of manufacturers depend upon it for the only source of ignition, there are, nevertheless, many who desire to eliminate cranking by starting "on the spark" and also to have an emergency ignition always in reserve in case of accident to the main one (the Magneto). An auxiliary source of ignition is therefore necessary, and hence the term "Dual Ignition," which means an Ignition System comprising two separate sources of current, but using one set of spark plugs only. One of these two sources is the magneto, the other is either a storage battery or dry cells.

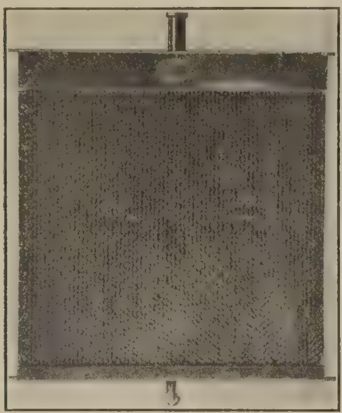


The first dual ignition system was devised by Ernst Eisemann as early as 1903, and our precedence in the field has given us the benefit of much experience and has been the means of our producing the present apparatus, whose keynote is Compactness with Reliability.

This present dual system consists of a direct high tension magneto and a combined transformer coil and switch; the transformer proper being used only in connection with the battery, and the switch used in common by both battery and magneto systems. The magneto is practically the same as the single ignition instrument, with the exception of a few changes and additions as hereinafter described. To insure reliability, the vulnerable parts of each system are distinctly separate from those of the other. For instance, separate windings and contact breakers are used for each system. On the other hand, parts that are not subject to accident, or rapid wear, are used in common, so as to avoid unnecessary duplication.

Hall-Scott Radiators

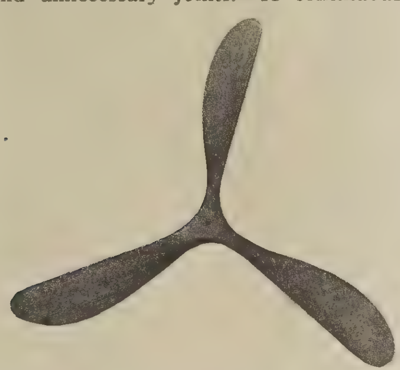
Hall-Scott light-weight radiators are amongst the lightest and most efficient radiators on the market. They are extremely simple in construction, allowing of immediate repair to any part that might be damaged. All radiators are



fully nickeled, and carry the Hall-Scott nameplate as a guarantee of their excellence. Hall-Scott standard radiators for all types of Hall-Scott aviation motors are carried in stock, for immediate delivery by the Hall-Scott Motor Co., Crocker Building, San Francisco, Cal.

Simmons Propellers

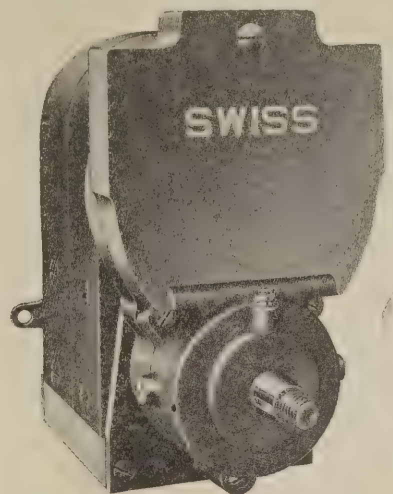
The Simmons aerial propellers, put forth by the Washington Aeroplane Company, 809 Water street, Washington, D. C. are increasing in popularity as a result of the painstaking care exercised in their manufacture. The method of laminating eliminates all cross joints and unnecessary joints. A continuous



endeavor is made by this company to have every piece of the same material, continuous from tip to tip, with every bit of twist or crook removed, and presenting a perfect edge grain face to all parts, which results in uniform strength, flexibility, and distribution of strain, which is absolutely necessary in a first-class blade. Enthusiastic users of these propellers include Tony Jannus and A. C. Beech.

Swiss High-Tension Magnetos

The function of any magneto is to deliver the spark at the exact fraction of the second required. It is not responsible and should not be charged with lack of gas, faulty spark plugs, poor connections or improper setting or timing. A magneto is an accurately constructed instrument, carefully though very substantially adjusted. Users who recognize these facts and treat magnetos as such, receive service and obtain results that are satisfactory. The Swiss Magneto, produced by the Swiss Magneto Company, of Chicago, is a high-tension, single system magneto, operating without batteries or coils. It produces an extremely hot spark, uniform in heat value



at different speeds, whether at advanced or retarded positions. The Swiss is made for four and eight cylinder engines, of the two and four cycle type. It is now being used largely on automobiles, farm tractors, aeroplanes and marine engines.

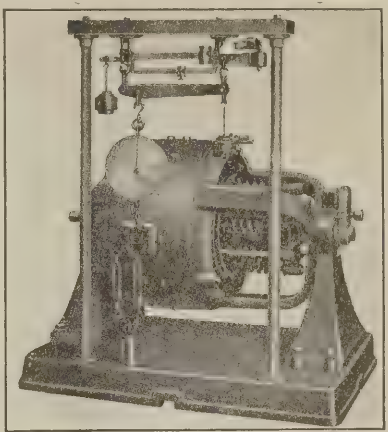
Master Spark Plugs

The Master spark plug is amongst the most efficient that has been used for aeronautical equipment. The Hartford Machine Screw Company, Hartford, Conn., for many years made spark plugs and spark plug parts for the majority of the manufacturers. In many instances spark plugs sold under another name were really Hartford Machine

Screw Company products. The Master spark plug is heavy and substantial in construction. Extreme simpilcity of design admits of plug being taken apart, cleaned and reassembled many times with no resultant leakage. It has a heavy insulating core, which is of a special nature, and will withstand strains destructive to ordinary insulators.

Sprague Electric Dynamometer

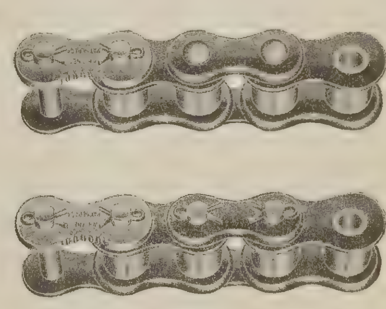
The Sprague Electric Dynamometer is a machine for measuring horsepower, generated and absorbed. It is a device by means of which actual values of



torque and speed can be measured at any and all loads and speeds within the range of the machine under test. It is the ideal device for testing aeroplane engines and other propellers; for testing the power required to drive centrifugal pumps, etc. It differs from all other forms of dynamometers in many features which make it pre-eminently suited for classes of work to which it is applied. Among these features are flexibility, accuracy, simplicity, reliability, economy, the widest range of speeds and the maximum braking effort at all speeds. The Sprague electric Dynamometer is built in all sizes from 1 h.p. to 500 h.p. and for speeds up to 4,500 r.p.m.

"Whitney" Chains

The "Whitney" cotter detachable chain has established a reputation which few other detachable types have approached. It is one of the most practical chains made for motor vehicles because it can be taken apart at any link, and lengthened, shortened or repaired without the



use of any special tool. The above cut illustrates Whitney chains detachable and riveted types. In the detachable chain all links on one side are riveted and all links on the opposite side are detachable. One link only is the connecting link this being distinguished from the others by notches in the top surface. All detachable links except the notched connecting link are forced tightly onto the rivets and should not be disturbed unless it is desired to shorten chain or make repairs. In the rievted chain all links on both sides are riveted with the exception of the one connecting link shown in the cut. Both types are made by the Whitney Manufacturing Co., Hartford, Conn.

FIRST AERO SQUADRON TO MEXICO

ARMY officers, and the large body of our intelligent citizens who have watched the progress of military aeronautics in Europe, are interested in the part the First Aero Squadron will play in the pursuit of Villa. No American aero squadron ever before has had actual military service. Machines were sent to Vera Cruz and there has been aerial scouting done along the border, but this is the first real test of the "fourth arm" of the service.

Capt. Benjamin D. Foulois, in charge First Aero Squadron.

Captain Benjamin D. Foulois, a veteran Army flier and one of the most efficient in the service, will be in command. He will have under him the ten Army officers who comprise the "fliers" of the squadron, and the eighty troopers completing the detachment. The officers taking part will be, in addition to Capt. Foulois, Lieuts. J. R. Carberry, T. S. Bowen, I. A. Rader, C. G. Chapman, Capt. T. T. Dodd, Lieuts. H. A. Dargue, W. G. Gowell, W. G. Kilner and R. H. Willis.

Mr. W. Leonard Bonney, an expert American aviator, who has just returned from Mexico, where he was commanding officer of Gen. Carranza's aviation forces, was selected by the Aero Club of America to have charge of mobilizing a squadron of experienced aviation pilots, who are to prepare and be kept in readiness, subject to call by the United States Army.

The Aero Club of America telegraphed to Secretary Newton D. Baker on March 11th, as follows:

"Hon. Newton D. Baker,
Secretary of War,
Washington, D. C.

The Aero Club of America will gladly give all possible aid in furnishing aviators and machines. We can offer aeroplanes and men for active service in Mexico. We are in close touch with all aviation pilots and place our services at disposal of the Government. We await your orders.

Aero Club of America."

Secretary Baker replied on the same date, as follows:

"Aero Club of America,
297 Madison Ave.,
New York City.

I greatly appreciate your patriotic offer placing your services at the disposition of the government and every effort will be made to utilize them and will take advantage of your offer should occasion arise. The expedition which is now going into Mexico has all the aeroplanes necessary.

Newton D. Baker,
Secretary of War."

Since this telegram from Secretary Baker was sent, the situation has become serious, and it is evident from the statement of Gen. Funston that a large number of aviators are needed as soon as operations begin. Only aviators can scout over Mexican territory with little danger. Others, Gen. Funston states, will face death. He says: "Villa troops will at times surprise these scouting parties. In ordinary warfare our men might, if hopelessly outnumbered and the resistance was futile, surrender with safety. To surrender to Villa, however, would be worse than suicide. Villa's men will kill every American they can lay hands on. Every encounter with them means a fight to the death for our men."

The Secretary of War has ordered Gen. Scott to instruct Gen. Funston to use as far as possible the squadron of aeroplanes of the Army. This consists of eight biplanes, equipped

Members of the First Aero Squadron who will see service in Mexico

with 90 h.p. motors, which, on account of their low power, could not climb fast enough in case of emergency, the Mexican atmosphere being so rare as to require high-powered aeroplanes for safe flying.

A meeting of the Board of Governors was held, at which there were present: Mr. Alan R. Hawley, President; Mr. Henry A. Wise Wood, Mr. John Hays Hammond, Jr., Mr. W. Redmond Cross, Mr. Evert Jansen Wendell, and Mr. Henry Woodhouse. On motion of Mr. Hawley, it was decided that it would be wise to take immediate steps to provide a reserve of trained aviators to be trained immediately, and to be supplied with high-powered biplanes, so that they will be ready to meet possible need.

It was decided, therefore, to immediately mobilize a squadron of trained aviators, selecting men of experience who hold aviation pilot certificates, and keep them in training until they have obtained what is called the "superior license," and to supply them with high-powered biplanes, such as are needed for effective work in Mexico. While these aviators are being mobilized and equipped, twenty more aviators will be selected and kept in readiness.

Mr. W. Leonard Bonney, the late commander of Carranza's aviation forces, has been put in charge of mobilizing these aviators. Among the men selected are:

Captain Ralph E. McMillen, who is in command of the aviation section of the Nebraska National Guard, and an aviator of considerable experience. The Aero Club of America wired to Brig. Gen. P. L. Hall, Jr., Adjutant General of Nebraska, asking if he could detail Captain McMillen to be one of the first six to be called upon in case of need, and General Hall promptly replied, detailing Captain McMillen. The Aero Club immediatey mailed a check to pay Captain McMillen's expenses to take a course of training with a high-powered machine at the aviation school at Newport News.

H. Roy Waite, an experienced pilot connected with the Sturtevant Aeroplane Company of Boston. Mr. Grover C. Loening, Vice-President of the Sturtevant Company, called at the Aero Club and assured the club that his company would be glad to place Mr. Waite at the disposal of the club.

Robert G. Fowler, the veteran aviator, who flew over the Sierras, and practically across the continent in 1911. He also flew across the Isthmus of Panama. He is the only man who has flown across the Isthmus to date.

Mr. John Guy Gilpatrick, who, as teacher at the Curtiss Aviation School at Toronto, Canada, flew many miles on high-powered aeroplanes, such as would be needed for a campaign in Mexico.

Mr. B. B. Lewis, the New York sportsman, who owns a Wright biplane of the latest type.

S. S. Pierce, an American aviator, who has had extensive experience in Europe, and had charge of an aviation school during the Balkan war.

F. K. Jaquith, who has had three years of experience and holds a record for having made two thousand flights without a mishap of any kind. Mr. Jaquith flew from Atlantic City to New York last year.

Beryl H. Kendrick, who last year flew from Albany to Ocean City, Md.

Mr. Alan R. Hawley, in a statement to the press, said that the Aero Club of America will do everything necessary to prepare to meet the need. He said:

"To prepare to meet a need does not mean to wait until hundreds of men have lost their lives. We ought to prepare to preserve the lives of our soldiers. An aeroplane is undoubtedly worth a thousand soldiers in such a campaign as the American forces are about to undertake. A hundred aeroplanes could easily round up Villa and his band in a very short time, where it might take thousands of men a long time, with considerable losses, to attain the same end."

A PERFECTLY GOOD. WAR EAGLE—WHAT THERE IS OF HIM.

Courtesy N. Y. Herald.

William Leonard Bonney, on the right, who is now at Newport News getting experience on high-power military tractor. In the center General Gonzales, in charge of the Carranza Aviation Squadron

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

DETROIT AERO RESEARCH AND MODEL CLUB
c/o William P. Dean, 1717 Concord St., Detroit, Mich.

BUFFALO MODEL AERO CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

THE NATIONAL MODEL AEROPLANE COMPETITION

Held Under the Sanction of the Aero Club of America

THE National Model Aeroplane Competition for 1916 is to consist of seven monthly model aeroplane contests, to be held in every part of the country simultaneously. Nearly $700 is offered for prizes. These contests are to be open to all Model Aero Clubs and organizations in America, to be timed and judged by officials of the large Aero Clubs, and wherever there are no Aero Clubs, by representatives of the Aero Club of America.

The contests are to be held on any day during the last half of each month, beginning with April next, at places selected by the model clubs. The Model Aero Clubs are to hold elimination contests, at their own convenience, to pick out six representatives and six substitutes to represent their club at the official contests. The six representatives need not necessarily be the same in each contest. Elimination contests need not be held for representatives to fly in the contests for mechanically driven models.

The nature of the contest is to be different each month, as follows:

SCHEDULE OF CONTESTS.

April—Distance, launching from hand, rubber strand driven models.

May—Duration, launching from hand, rubber strand driven models.

June—Duration R. O. G. rubber strand driven models; duration R. O. G. mechanically driven models.

July—Duration, rising from water, rubber strand driven models; duration, R. O. G. mechanically driven models. Quarter model flying boat and hydroaeroplanes, the flying boats to be allowed 25 per cent. in addition to duration achieved.

August—Distance, R. O. G. rubber strand driven models; distance, R. O. G. mechanically driven models.

September—Duration, R. O. G. rubber strand driven models; duration, R. O. G. mechanically driven models.

October—Distance, launching from hand, rubber strand driven models; distance, R. O. G. mechanically driven models.

PRIZES.

Cash prizes offered by the Aero Club of America, from the National Aeroplane Fund, will be awarded to the individual members of the various clubs making the best records each. The prizes amounting to nearly $700, will be awarded as follows:

Thirty dollars, $20 and $10 will be awarded the individual members making the best records in the contests held exclusively for mechanical driven models, that is, models driven by means other than rubber strands, such as compressed air, gasoline or steam motors. These contests to be held according to the schedule, one a month for five months.

Twenty-five dollars, $15, 10 and $5 will be awarded monthly to the individual members of each club making the best records in the contests for rubber strand driven models. Contests to be held according to the schedule.

The Villard Trophy: The Villard trophy will be awarded to the club whose six representatives make the largest score during the seven months—this to be computed by the point system.

A club becomes the owner of the trophy when it has been won for three consecutive years by its members.

GENERAL RULES AND REGULATIONS GOVERNING THE COMPETITIONS.

Article 1. The contests are to be held any day during the last half of each of the seven months, the selection to be at the discretion of the clubs themselves.

Article 2. Each club is to select its own place for holding contests and make all arrangements with the local Aero Club representatives appointed to judge the events.

Article 3. Each club is to hold its own elimination trials during the first two weeks of each month, to select six representatives and six substitutes and when ready to make the official trial notify and make all arrangements.

Article 4. Only six contestants will be allowed to compete in each contest, but these need not be the same each month.

Article 5. Each club is to co-operate with its local judging committee and arrange things so that the judges will be relieved of all the routine and will only have to officially judge and pass on the events.

Article 6. Each contestant will be allowed three trials in each event and his best flight will count.

Article 7. Models may be repaired or changed during each contest.

CONDITIONS GOVERNING THE MEASURING AND JUDGING OF THE CONTESTS.

Article 8. All distance contests are to be measured with a steel tape. Each club is to arrange its events so as to facilitate quick and accurate measuring of the distances.

Article 9. All duration events are to be timed with accurate split-second fly back stop watches.

Article 10. General Regulations of the International Aeronautic Federation will govern in the cases of dispute.

CONDITIONS GOVERNING THE WINNING OF THE VILLARD TROPHY.

Article 11. The Villard Club Trophy will be awarded to the club whose members collectively make the best showing in the seven contests, this to be determined by the point system after all the scores of the six representatives of each club have been received by the contest committee of the Aero Club of America.

Article 12. Same model cannot be flown by more than one contestant.

The Villard Trophy

The Villard Trophy, which was generously donated by Mr. Henry S. Villard, member of the Aero Club of America, to be competed for by the Model Aero Clubs of America, was won for the first time by the Illinois Model Aero Club, of Chicago. The requirements for the permanent ownership of this beautiful trophy is that a club must win it for three consecutive years. In the endeavor to have the first year to their credit members of the Illinois Model Aero Club, Aero Science Club, and Pacific Northwest Model Aero Club succeeded in establishing a number of new world records which it is hoped will be surpassed in the coming National Model Aeroplane Competition.

The Hittle Tractor Hydro

By Ellis C. Cook.

Considerable interest has been shown in the Hittle Hydro on account of its wonderful showing in the Villard Competition, when it made the remarkable duration of 116 sec. This is all the more noteworthy when it is considered that the previous record for this type of model has been but 29 sec., just one-fourth of the duration made by Mr. Hittle's model.

Mr. Hittle's model shows many new and original features not hitherto combined on any one model. In the first place the model is of extremely light weight, weighing complete but 1.75 oz. The floats and their attachments have been minimized to the lowest possible point in the matter of weight and wind resistance. Every possible method was utilized in order to cut down weight and resistance on every part of the model. This doing away with resistance resulted in the excellent glide of 8¾ to 1.

Frame and Tail Planes: The motor base is a single stick of white pine 5/6" deep and 45" in length. On the front end the bearing for the propeller is bound with silk thread and a waterproof glue of Mr. Hittle's own composition. This bearing is a small iron forging, somewhat in the shape of an "L." It is streamlined and of very light weight. At the rear end of the motor base is attached the piano wire hook for the rubber. The stabilizer consists of a segment of a circle and measures 12" x 8". It is attached to the under side of the motor stick. The rudder measures 3½" x 3½" and is attached to the stabilizer at the rear of the motor stick.

Wing: The wing is built up of two beams of white pine with ribs and tips of bamboo. It has an area of 215 sq. in. with a total span of 43" and chord of 5⅛". It is given a small dihedral and the wing tips are slightly upturned at the rear.

The trailing edge is longer than the entering edge and the ribs are somewhat oblique in order to secure an even spacing. The wing is attached to the frame by two small bamboo clips, which hold it rigidly and permit adjustment. The wing is set at an angle of about 4 degrees with the line of thrust.

Floats: Both the float arrangement and the shape of the floats are novel. Two floats which take practically the whole weight of the machine are situated directly under the wing, just far enough behind the center of gravity that the model will not tip backward. A single float of triangular section is just behind the propeller. The struts attaching the floats to the frame are of bamboo, streamlined. The construction of the float frames is of bamboo also. The weight of the floats and their attachments is but .23 oz.

Power Plant. The four-bladed propeller has a diameter of ten inches and a theoretical pitch of fourteen inches. It is built up of two bladed propellers carved alike from ⅝" thick blades. They are joined at the center and securely glued. The blades are fairly narrow, tapering almost to a point at the tips. The propeller is driven by five strands of 3/16" strip elastic at about 760 r.p.m. when in flight. The rubber was given 1,500 turns when it did 116 sec. and was wound less on the other two trials. This is not the maximum turns which it is possible to give the rubber, so that it will be seen that the model was not fully extended at any time.

As to the action of the model in the air, it is a very slow and stable flyer, notwithstanding its light weight and large surface. It does not climb higher than about fifteen or twenty feet at the best, but finishes its flight with the propeller practically unwound. It is not what may be called a freak flyer, as its average of a fraction of a second under 90 sec. for three flights shows.

Any further particulars may be obtained from Ellis C. Cook, 6935 Stewart Ave., Chicago, Illinois.

Illinois Model Aero Club

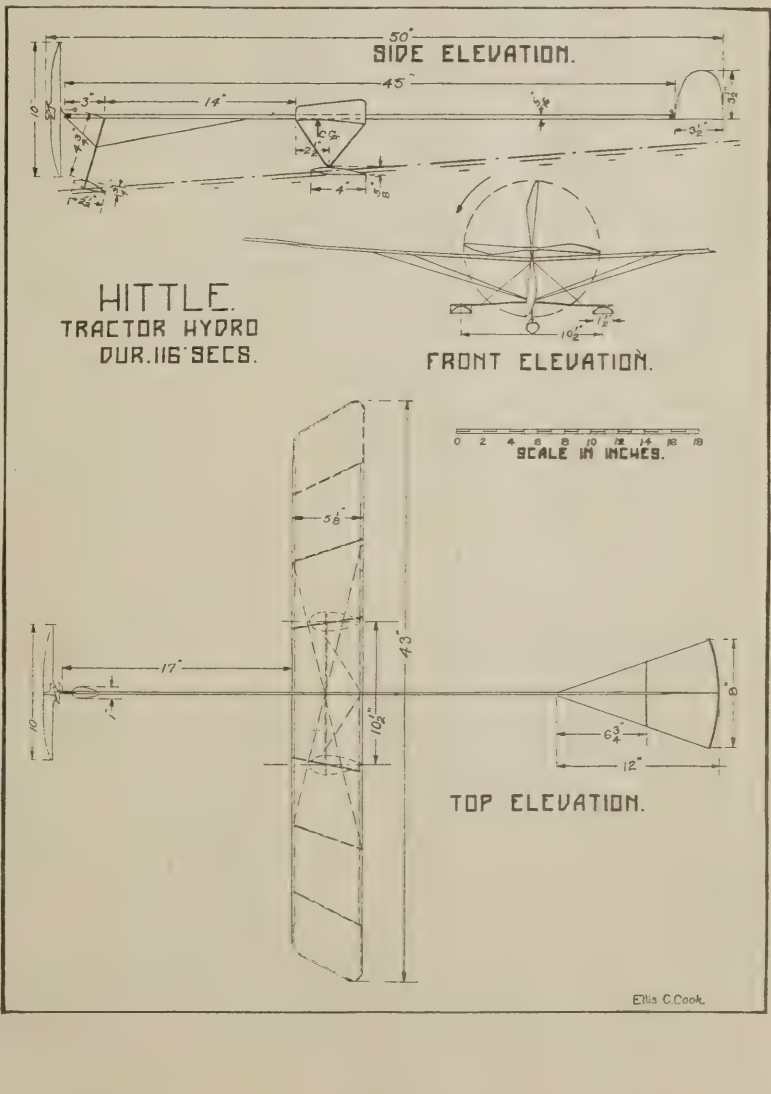
By A. E. Nealy.

Friday evening the fifth of a series of scientific lectures was held in the south parlor of the Auditorium Hotel by the Social Activities Committee. This meeting, which had an even greater attendance than any preceding, dealt entirely with man-carrying machines. Mr. H. Frey, of the Aero Club of Illinois, spoke on "Gliders as a Preliminary Experiment to the Construction of a Powered Machine," reciting his exciting experiences and the conclusions he has drawn from glider flight. He refuted the popular opinion that gliders are inexpensive and simple to make, claiming that they must be even more correct in design and lightness than the powered machine. The second speaker was Mr. Emil Laird, who delivered a very informative lecture on "Various Types of Fittings, How Made, Steel Used, etc." Mr. Laird brought with him to the meeting a collection of fittings and the different pieces of the more complex ones for inspection. His talk was greatly appreciated by every one and after the meeting Mr. Laird found himself surrounded with a host of questioners seeking after knowledge. Mr. Hittle, who was unable to deliver his lecture, will speak at the next regular meeting. In the latter's place Mr. Verclairen spoke on "Steam Model Motors," and exhibited one in the process of construction.

The Franklin School Model Aeroplane Club

On Thursday evening, March 9th, the Franklin School M. A. C. held its first meeting at the Y. M. C. A. Building, Orange, New Jersey. A number of members were present. Mr. Pierre Sherry was elected President and Mr. Clarence Maguire, Secretary. A few of the members have been experimenting with models and the indications are that with a little coaching good flyers will result. The members of this club are preparing for the coming Model Competition, which will be held in the spring, under the auspices of the Y. M. C. A. of Orange. It is also the intention of the members to take part in the National Aeroplane Competition, which will continue throughout the summer and which will be held under the auspices of the Aero Club of America. In the future the meetings will be held on Friday evening in the Y. M. C. A. Building. Many new members are expected to be enrolled at the coming meeting.

At the last meeting Mr. G. A. Cavanagh, representing the Aero Science Club of America, was present. He will be present at every meeting to help the members prepare for the coming contests. Secretary, Mr. Clarence Maguire, Y. M. C. A. Building, Orange, N. J.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

With the Aviators En Route

If you happen to be among the Chippewa Indians and want a piece of apple pie you have to say, "Pah-tah-me-she-me-bah-she-ne-gah-ne-we-ko-be-baw-kwa-she-gan."

It would be much easier to say, when it came time for dessert, "Prunes, please."

An Epping, Wis., man, after reading "Quo Vadis," boasted that he could throw a bull. The bull threw him and broke his leg.

Moral.—Don't throw the bull unless you can.

THE LATEST MODELS.
Mrs. Sumclass—"Take the butterfly plane back to the garage, Emil, and bring the mosquito model. I've concluded to go to Jersey instead of Newport."

Served Him Right

"I admit I was found in the possession of firearms," said the prisoner. "But it's only a joke of mine, my lord."

"Explain yourself," said the magistrate.

"Why, I put two pistols in my pocket when I go out to a friendly gathering. Then I start talking of aeroplanes."

"Well?"

"Then I say my life was once saved by parachutes."

"Yes?"

"And then I pull out the pistols and say, 'Pair o 'shoots.' Ha, ha! See?"

"Yes, I see. Did you make up that joke yourself?"

"Yes, my lord."

"Two years hard labor!"

The Best Excuse.

Aviator Brown—Ignorance of the law excuses no one.

Aviator Smith—Quite so. It is much better to be rich and hire good lawyers.

Gibbs—Bilson expressed a good deal of sympathy for poor Blank, the mechanic. Did you try him for a contribution?

Dibbs—No. I know Bilson; he's like the letter "p"—first in pity and last in help.

Letters of a Mechanician

By A. E. Nealy

"Slim:

"Marshals an' Sheriffs is things I hate, Slim. In these here little hide-an'-go-seek towns they thinks they is the whole u. s. government an' go around with brass button coats and overall trousers, askin' every question their little wag-tops think of, all the time thinking that anything they ask is sensible because they wus the ones what asked it.

"I wus a puttin' the elivater on the foosilahge when up comes one an' spreads his feet apart an' pops out with a chew of tobacko: 'What doin', fren?' My hart falls down on the lump in my throte an' I looks up an' groans to myself to find it wus one of 'em, only this one wus workin' awfull early.

"'Disconnectin' the foosilahge onto the stableizer so's the airlerons an' diheedrhal angel won't intirfere with the senter of gravety,' I tells him—but it didn't phase 'Buttons' a-tall.

"'So,' says he, 'that's it, eh?'

"'Yeh, says I.

"'Thot so,' says he, an' pulls his chin vegetables.

"I groaned again. There wus no hope with this one, no hope a-tall, so I thinks I will make him useful.

"Will you hold this here foosilahge off the ground a minit while I fix the tail skid?' I asks.

"'Tail?' he comes back, 'where's tail? Gotta tail?' an' he commences to start looking around the inside of the foosilahge to find it.

"'Naw!' I yells. 'It's the elivater here—stableizer—elivater—ahmpennage!'

"'Oh, yes, that's it,' he smiles. 'Now what do you want me to hold?'

"'Foosilahge,' says I.

"'Where is it?' says he.

"'Right there!' says I, pointing to it.

"'Buttons' goes up to it, falls all over it an' starts lookin' inside of it again. A great idea comes into my head.

"'Aint' it there?' I asks.

"'Can't find it,' says he

"So I goes over an' looks all over up an' down the inside of the foosilahge. 'Y'r right,' says I. 'Gee! that's too bad! We can't fly without it. Say!' I exclames, 'will you go up to town and get me one?"

"'Sure!' says he, 'where at?'

"'Anywhere,' says I. 'Most likely at the drug store.'

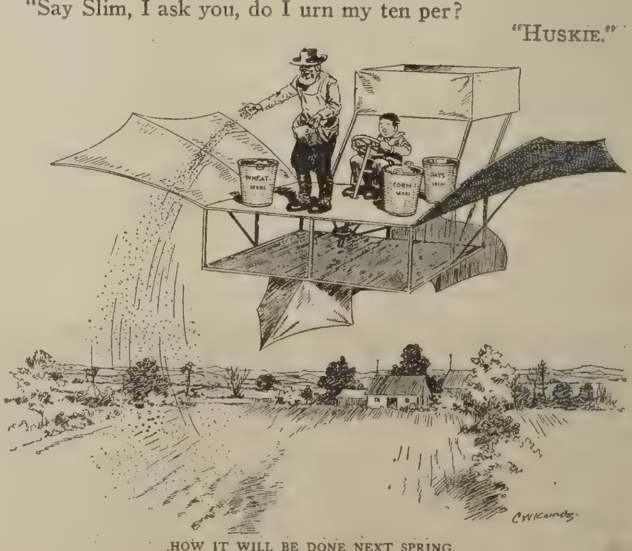
"'How much 'll I get?'

"'Here's half a buck,' I says, throwin' it at him. 'Get a quarter's worth—and keep going till you get it. We can't fly without a foosilahge."

"'Betcha not,' says he, and went.

"Say Slim, I ask you, do I urn my ten per?

"Huskie."



HOW IT WILL BE DONE NEXT SPRING.
"Now steer over the forty-acre corn patch and we'll git it planted afore breakfast."

G. DOUGLAS WARDROP
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AERIAL AGE WEEKLY

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Benson to Blame

AMAZED to find that Rear-Admiral William S. Benson, Chief of Naval Operations, was directly responsible for cutting $11,600,000 from the estimates for naval aeronautics, Mr. Alan R. Hawley, President, Aero Club of America, has written to Admiral Benson the following letter, requesting the Admiral to make a public statement giving his reasons for attempting to prevent the establishing of a substantial aeronautical organization in the Navy. The letter follows:

"Rear Admiral William S. Benson,
"Chief of Naval Operations,
"Navy Department,
"Washington, D. C.

"Dear Sir:

"We are amazed that you stated to the Committee on Naval Affairs of the House of Representatives that you are directly responsible for cutting $11,600,000 from the estimates for naval aeronautics, leaving only $2,000,000 for aeronautical equipment for the Navy; and that you only plan to have aeroplanes for scouting and you are satisfied with having a single aviation station for the United States and the Possessions, leaving even the Panama Canal aerially unprotected.

"You take this position despite the lessons of the European War, despite the expressed desire of the people of this country to get 'a Navy impregnable to the Navies of the World,' and contrary to the recommendations of the General Board and the aeronautical experts of the Navy. You would continue the practice followed in the past five years, notwithstanding the fact that this practice has prevented the Navy from getting a substantial aeronautical organization.

"Next to the Committees on Naval Affairs of both Houses, and the General Board of the Navy, you are the most powerful agent in the Navy, and your influence can foster or prevent the developing of 'a Navy impregnable to the Navies of the World.'

"As these are critical times, we feel that it is our duty to request that you make a public statement explaining how you expect the United States Navy to acquire a substantial aeronautical organization this year by continuing a practice which has proven so deterring that at the end of five years the Navy has not yet even the skeleton of an aeronautic organization.

"The achievements of the substantial air services of the nations now at war are published daily by newspapers in the United States. These achievements include many air raids in which as many as eighty aeroplanes have participated, sinking of submarines, and raiding of submarine bases; holding up and sinking of transports by seaplanes and dirigible balloons, including an instance where a torpedo launched by a seaplane sank a transport.

"We know that the Admiralties of different nations which have thousands of aeroplanes are constantly apologizing to the people of their countries for not being able to acquire larger air fleets—fast enough to defend their country and protect the lives of their people. We learn from some of the statements made in Parliament that England, where there had been established seven naval aeronautic stations before the war, has now close to sixty aeronautic stations, and is establishing more.

"There is only one aviation station in the United States to defend our vast coast line—and less than twenty rapidly growing obsolete machines in commission.

"We also know that the air service of other navies consists of not only aeroplanes, but also of dirigibles, observation balloons, kites, aeroplane ships, balloon ships, experimental and testing stations. We find that every naval and military aviator in Europe is allowed three aeroplanes. We learn that the personnel of the French air service includes more men and officers than we have in the United States Army; and the personnel of the British air service includes more officers and men than we have in the United States Navy. We also learn that the British Navy has, at last reports, about 2,000 aviators, 5,000 aeroplanes, and a large number of dirigibles, observation balloons and other aeronautical equipment. We are told that Germany has 3,000 aviators, 9,000 aeroplanes and 80 Zeppelins. The heads of the British Admiralty have stated that the day is here when the command of the sea is of little avail unless it is coupled with the command of the air.

"You are correct in saying that the Navy can get aeroplanes as fast as it needs them. Large orders for aeroplanes and aero motors placed in this country, which probably aggregate over $25,000,000, have built up an aeronautical industry which promises to soon become second to none. There are already half a dozen large aeroplane and motor manufacturers who are producing aeroplanes and aero motors as efficient in every way as the best European products. A score of other firms are preparing to do likewise.

"American seaplanes, as a matter of fact, are superior to European seaplanes, there being no seaplanes in Europe capable of carrying upwards of 1,500 lbs. of useful load, as American seaplanes are carrying. About two hundred seaplanes having power plants ranging between 200 h.p. and 320 h.p. have been delivered to European countries.

"American manufacturers have solved, one by one, and most successfully, the problems of getting suitable material for manufacturing efficient aeroplanes and motors. Half a dozen new, substantial concerns have entered the field in the past few months, and will soon be ready to add to the facilities for manufacturing aeroplanes and motors.

"But, having the best aeroplanes and motors avails little if there are not sufficient trained men. There are—five years since the Navy first took up aeronautics—less than thirty trained aviators in the Navy. This includes officers who have left the aviation service and officers who are now in Europe, connected with the American Embassies at Paris, London and Berlin. You know whether they would be available for service. It also includes the technical officers who are in charge of different departments of the Pensacola Station—who would be most needed where they are in time of war.

"The fact is that, in case of war, we would need many times the number of trained men available only to act as inspectors of aeroplanes and training other officers and men.

"We therefore submit that your action in slashing $11,600,000

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

from the estimate for naval aeronautics was not for the best interest of the Navy and it is our duty to request that you make a public statement giving your reasons for attempting to prevent the establishing of a substantial aeronautical organization.

"Very truly yours,
"(Signed) ALAN R. HAWLEY,
"President, Aero Club of America."

A Million Dollars Asked to Save Lives of 10,000 American Soldiers

THE following telegram has been sent by the Aero Club of America to President Wilson, Secretary Baker, Congressman John J. Fitzgerald, Chairman, Appropriations Committee, House of Representatives; Congressman James Hay, Chairman, Committee on Military Affairs; Senator George E. Chamberlain, Chairman of Committee on Military Affairs, of the Senate, and other Washington authorities:

"An immediate appropriation of one million dollars to at once equip four aero squadrons with the necessary high powered aeroplanes may save lives of ten thousand American soldiers on the Mexican border. Army aero squadron at Mexican border has only six low-powered scouting aeroplanes. Signal Corps has no funds available at present to get necessary equipment. There should be three aeroplanes available for every aviator now at Mexican border which is the number of aeroplanes allowed to each aviator in Europe, and three more squadrons should also immediately be put in readiness. The Aero Club of America is training fifty aviators to place at the Army's disposal to make up shortage of Army aviators. To prepare to meet a need does not mean to wait until hundreds of men have lost their lives. We ought to prepare to preserve the lives of our soldiers. An aeroplane is worth a thousand soldiers in such a campaign as the American forces are about to undertake. A hundred high-powered aeroplanes would make it possible to round up Villa and his band in a very short time where it might take thousands of men a long time, with considerable losses to attain the same end.

"ALAN R. HAWLEY,
"President, Aero Club of America."

Mr. Hawley said the officials of the Club were amazed on Sunday, when the following telegram was received, in which it is stated that "the expedition which is going into Mexico will be there for a short time and that it has all the aeroplanes necessary." The telegram, which was in reply to a telegram sent by the Aero Club offering the services of civilian aviators and aeroplanes which the Club is mobilizing to meet any emergency, follows:

"Aero Club of America,
"297 Madison Ave.
"New York.

"The Chief of staff directs me to state that the expedition which is going into Mexico will be there for a short time and that it has all the aeroplanes necessary. Your patriotic offer placing your services at the disposal of the government is greatly appreciated and every effort will be made to utilize them if possible.

"S. REBER."

Bats to Fight Rats

IN a recent issue of a Baltimore newspaper W. H. Logue, who has used his pen excellently to further the cause of aviation, discourses on the sending of the First Aero Squadron to Mexico, as follows:

"The Army practice in Mexico affords opportunity for experimental development of the aeroplane in coping with the snakelike anarchist who assassinates from ambush and then runs like a rat into the wild tangle which cloaks the desperado and the scorpion.

"The winged motor could promptly trace the pest to his hole. Military aircraft evolution needs something of the actual exercise in this country that it is getting abroad, where an English commoner has just won his bye-election seat in Parliament on the issue of more vigorous advancement of the British air service. The United States regular Army aeroplane equipment is notoriously defective and several Representatives might save their seats in Congress next fall on this issue. Much attention should be directed to the recent Ohio National Guard's step to create an aerial corps.

"Those who see in the new mechanical evolution the quickest means of guarding America's hoarded honey with irritable bees naturally will closely watch the present serviceability of mechanical leather-wings in catching human rats."

Our Army in the Quest for Villa

(Editorial from N. Y. *Sun*)

ON Sunday last, Major Samuel Reber, of the Signal Corps, who has charge of the army aviators, telegraphed to the Aero Club of America: "The Chief of Staff directs me to state that the expedition which is going into Mexico will be there for a short time, and that it has all the aeroplanes necessary." No doubt the wish was father to the thought, but can any army officer know how long Pershing's expeditionary force will be in Mexico? It seems to have crossed the border six days after Villa's raid on Columbus, and in six days the mounted Villistas could put a good many miles between themselves and their pursuers. It is probable, therefore, that the American expedition will not be in Mexico for a short time; indeed, it may be looking for its quarry for months.

The tone of Major Reber's despatch indicates that the War Department will depend mainly upon cavalry scouting to discover the whereabouts of Villa's band. Yet the aeroplane is indispensable for such a difficult quest. There is a report that the War Department believes the topograph[r]y of northern Mexico is too rugged for scouting with aeroplanes. But are Chihuahua and Sonora very different from the Balkan country? A bulletin of the French War Office shows what can be done by aviators who have stanch machines and are competent:

"Army of the Orient—Flying over mountainous regions in intense cold, our aviators are constantly reconnoitering the Balkan lines. They have shelled Uskub, Istip and Strumitza and other encampments with great effect * * * and by wireless apparatus controlled our gunfire."

The act of July 18, 1914 (nearly two years ago), provided for the organization of the aviation branch of the army and placed it under the supervision of the Signal Corps. Unfortunately the army's progress in aviation has not since been brilliant; in fact, it has been a great disappointment and more or less of a scandal. Although active service in Mexico was expected by every Second Lieutenant fresh from West Point, the Signal Corps was not ready when the emergency came. There are said to be not more than eight machines available—the Aero Club, which has excellent sources of information, puts the number at six. How many machines are at General Funston's disposal is mere conjecture.

What we do know is this: that in the crystal clear atmosphere of northern Mexico aeroplane scouting should be more useful than any reconnoitering the cavalry could possibly do—if the army has machines that can fly out from the headquarters camp and keep the air for a few hours, thoroughly trained aviators being in the pilot's seat with strong field glasses. The cavalry would be able to supplement the work of the air scouts. Together they should find Pancho Villa. If the machines are equipped with a wireless outfit—we suppose the army has the ground apparatus—there should be quick results. We are not going to prejudge the army flying corps, but we submit that the quest in Mexico should put it on its mettle. We trust that Major Reber will treat the country to an agreeable surprise.

Birthplace of Aviation

(Editorial in Pittsburg *Post*)

WHILE the memory of Samuel Pierpont Langley has never lacked for homage in this city and is yearly taking on greater significance to the people of this country and throughout the world, the tribute to be paid to the inventor this month by the University of Pittsburgh is to emphasize one feature of his work that has not been given the prominence here that it merits. By the work of Langley, Pittsburgh is entitled to recognition as the birthplace of aviation; that is, as the scene of the discovery of the principle of flying heavier-than-air machines. Dr. Holland, Dr. Brashear and a few others have frequently called attention to this, and *The Post* has urged that it be used in the literature advertising the city's distinctions, but the civic organizations have not acted on the suggestion as hoped. Now that the university is to take it up in a special way, let all join in giving impetus to the idea.

As *The Post* has pointed out, the oversight cannot be attributed to lack of interest here in the science of aviation. Experiments in aerial navigation have been going on here for years. This city has produced a number of aviators, and has two martyrs in that line, Calbraith P. Rodgers and "Billy" Badger.

As the birthplace of aviation no opportunity here to encourage the science should be overlooked.

The News of the Week

Aeroplanes at Pershing's Headquarters.

Just as we are about to go to press a dispatch states that six biplanes of the First Aero Squadron, under command of Capt. B. D. Foulois, arrived at General Pershing's headquarters March 20, for scout duty.

The machines were driven by Lieutenants S. C. G. Chapman, J. E. Carberry, H. A. Dargue, T. S. Brown, R. H. Willis, E. S. Gonnell. W. G. Kilner, in the seventh machine, was not reported.

The aeroplanes were tested out at Columbus, New Mexico, before the journey was made southward. Through the iron-clad embargo on all news, which the censorship continues, it is impossible to state in further detail the work of the Aero Squadron.

Climbs 12,400 Feet in 74 Min. With 90 H.P. Curtiss Motor

Lieut. R. C. Saufley, on March 9th, at the U. S. Navy Aeronautic Station at Pensacola, Fla., established a new hydro-aeroplane altitude record with Navy machine "AH-13" by climbing 12,400 feet in 74 minutes with light load. The machine he used was a Curtiss pusher type hydro-aeroplane equipped with Curtiss Model OXX motor developing 90 horsepower.

This breaks all previous hydro-aeroplane records for rate of climb per horsepower used.

THE CURTISS AEROPLANE CO.

New Jersey Reserve Aviation Section Commences Practical Work

Work on the aviation school and aeroplane plant founded by the New Jersey Naval Reserves, assisted by the Aero Club of America, has been started in Keyport, N. J., under the direction of Captain Ernest Janey.

Ensign J. Homer Stover and a battalion of militiamen are in charge of the work. The aviation school is on a sixty-acre tract at East Keyport. Flights will soon be made over Raritan Bay and inland. That a wireless station will be operated in conjunction with the training school and plant was admitted by the officer in charge.

Armored Aeroplane for N. Y. Naval Militia

There has been ordered for delivery May 1 for a Second Battalion of the New York Naval Militia an armored hydro-aeroplane.

The machine will cost $7,800 and of that sum practically all has been collected by a committee consisting of Commodore Forshew, Vincent Astor, Charles Lawrence, Meredith Bladgen and Aymar Johnson. The hydro-aeroplane is the gift of a group of patriotic citizens. The Aero Club of America gave $800 to the fund, Mr. Astor and George W. Perkins gave $500 each.

The men who will operate and maintain the machine will be trained at the expense of the Federal Government and the State of New York will pay for the upkeep of the plane.

Exports of Aeronautic Supplies

Recent exports of aeroplane parts to England as reported by the Collector of the Port of New York were: March 10, $43,760; March 14, $22,320; March 16, $148,000.

Harvard Men Will Have an Aero Corps

If plans which are now being made at Harvard University, Cambridge, Mass., go through there will soon be organized a Harvard Aero Corps for the purpose of training men for the army, the navy and, if the government permits for the French war front. The plan is the result of work on the part of Frazier Curtis, '98, late of the Esquadrille Americaine, Deuxieme Grou d'Aviation. It is proposed to model the organization of the Harvard Corps after the French camp at Pau. It is estimated that a Harvard Camp for 50 pupils would cost about $75,000 and that an aviation camp for 200 pupils would cost about $300,000.

Mr. Curtis will obtain the signatures of all members of the university interested in the project, and if the number is sufficient will establish a training camp, to be the preparatory school for the Aero Corps. The locaton of the camp, hangars and repair shops will probably be on Long Island, or at the old Harvard aviation field, in Atlantic City.

The Curtiss 250 H.P. Motor

Under the careful supervision of Mr. Charles B. Kirkhan, head of the motor department of the Curtiss Aeroplane and Motor Corporation, the new 250 h.p. twelve-cylinder Curtiss motor is advancing with rapid strides. The first batch of five motors of this type will soon be ready and the first test will be made in the very near future with the Sprague dynamometer which has been installed in the new building adjoining the assembly room on Churchill Street.

Tractor biplane constructed by the Hamilton Manufacturing Co. of Seattle, Wash.

Aero Club of Pennsylvania Active

The members of the Aero Club of Pennsylvania have been very active during the last few weeks completing their plans for the aviation center at League Island, and the indications are that their efforts will be thoroughly successful and that the Philadelphians will see a good deal of flying there during the coming season. The League Island flying field is a most admirable location for both land and water flying.

Messrs. Kays and Von Figyelmessy will shortly receive the tractor biplane which has been constructed for them by the Sloane Manufacturing Company, at Plainfield, N. J. This machine will be equipped with a Curtiss O. X. Motor and considerable flying is contemplated by the two members owning the machine. An effort is now being made to secure a flying boat for the purpose of tutoring students who will ultimately graduate into the Pennsylvania Naval Militia. At the meeting of the Aero Club held last Friday evening Mr. Joseph A. Steinmetz, President, outlined a very comprehensive plan of campaign and the members present demonstrated that they would do all in their power to take up his splendid lead.

Mr. G. Douglas Wardrop, Editor of Aerial Age, who was present, complimented the members of the club upon the thoroughly aggressive way in which they were attacking the local problems and wished them every success in their efforts.

Lees Flies from Newport News, Va., to Washington, D. C.

On March 10th, accompanied by Chas. Pond, Walter E. Lees, one of the instructors at the Curtiss School at Newport News, flew from Newport News to Washington, D. C., making one stop on the way. They left Newport News in a 35-mile southwest wind at 2:30 P. M. and came down at 4:00 P. M. at a small town called Lewisette for gasoline. They decided to stay all night at Lewisette on account of the snowstorm. They left next morning at 11:45 A. M. and arrived in Washington at 1:45 P. M. The first 90 miles they flew in 1½ hours, but on account of a stiff head wind the next morning they were only able to make the next 90 miles in 2 hours. For the trip a Curtiss Flying boat equipped with a Curtiss O. X. 2 motor was used.

Air-Craft Manoeuvre With Navy

According to a dispatch which appeared in the Fort Dodge, Iowa, *Chronicle,* naval manoeuvres off the coast of Santa Barbara have been carried out during the last few weeks in which warring vessels, aeroplanes and hydro-aeroplanes have been taking part. Continuing the report states:

"The navy aviators have been playing along the coast in a practical demonstration of the value of their eagle eyes as observers, and the naval officers of the defending and attacking fleets have been given an opportunity to test out the methods for defense against the air scouts.

"Under secret orders from Washington, half a dozen war vessels have been playing a war game at Santa Barbara against a flock of aviators from the San Diego school of aviation. On Friday of this week, the naval and aero war vessels are getting some excellent training, incidentally, in the use of the high-angle guns for defense against aviators. The speed and distance of the aeroplanes must needs be gauged."

Col. Reber President of Wireless Association

Lieut.-Col. Samuel Reber, Signal Corps, U. S. A., has accepted the office of honorary vice-president of the National Amateur Wireless Association, whose purpose is the education and development of young men who may eventually be fitted for operators and engineers.

Re-organization of the Curtiss Company

Mr. Monroe Wheeler, Secretary of the Curtiss Aeroplane and Motor Corporation, has just announced various changes in the internal organization of the Curtiss Co.

This notice reads:

"Curtiss Aeroplane and Motor Corporation was incorporated under the laws of the State of New York on January 14th, 1916, and on January 19th, 1916, it took over all the assets and property, and assumed all the debts and liabilities of The Curtiss Motor Co. Since said latter date the business which was formerly conducted by Curtiss Motor Co. has been and will hereafter be conducted by Curtiss Aeroplane and Motor Corporation, with its principal office and place of business at No. 65 Churchill Street, Buffalo, N. Y.

"The Curtiss Motor Co. has ceased to do business.

"Curtiss Aeroplane and Motor Corporation has a branch office and plant at Hammondsport, New York; and also a branch office and plant at No. 1752 Elmwood Avenue, Buffalo, New York.

Its subsidiary company, the Curtiss Aeroplane Co., has offices at Hammondsport, New York, at No. 65 Churchill Street, Buffalo, New York, and at No. 1200 Niagara Street, Buffalo, N. Y.

"In order that parties dealing with the said corporation shall not become confused, it should be clearly understood that The Curtiss Aeroplane Co. manufactures and sells Aeroplanes and Flying Boats; and that Curtiss Aeroplane and Motor Corporation manufactures and sells Aeronautical Motors."

G. J. Kluyskens To Go Abroad

Mr. G. J. Kluyskens, manager of John Domenjoz, the well-known Swiss exhibition flyer, will go to Paris very shortly for the purpose of negotiating for the American agency of a well-known aeronautical motor concern in that city. Mr. Kluyskens states that Domenjoz has been engaged to fly at Havana, Cuba. During the recent Pan-American conference held at Washington, Domenjoz gave a splendid exhibition of aerial stunts. After looping-the-loop over the Capitol he performed a number of other feats much to the appreciation of the large crowds who witnessed the performance. At Richmond and other cities in the South where Domenjoz has flown his performances have been greatly appreciated.

A Correction

In the last issue of Aerial Age we inadvertently stated that Robert G. Fowler was the first aviator to fly over the Isthmus of Panama. Our attention has been called to the fact that this is incorrect and as a matter of fact, Clarence De Giers, an American aviator, who was very well known at the Garden City field a few years ago, flew from Panama to Colon, which he did in May, 1912.

At the Christofferson Aviation School. Left to right, Frank Bryant, Ray Ternstra, Gustave Jameson, Smith Penty, Harold Smith, Guy T. Slaughter, Aero Club representative, E. J. Calahan, and H. C. Christy

Sloane Manufacturing Co. Offers Biplane for Army

John E. Sloane, of the Sloane Manufacturing Co., and son-in-law of Thomas A. Edison, has offered to place at the disposal of the War Department one of his high-powered biplanes for use of the expedition in Mexico. The machine which Mr. Sloane would give the use of is the kind of machine that is needed for military service—the kind that he is building for foreign governments for use in actual warfare. When it is recalled that the aeroplanes with the Mexico expedition are of but 90 h.p. and the machine that is offered is 130 h.p. the great advantage of the Sloane machine over those now owned by the government is apparent. In his letter to Secretary of War Baker Mr. Sloane says:

"In connection with the Mexican campaign, I am of the opinion that our army should be equipped with a number of high-powered aeroplanes such as have been found suitable for service at the front.

"From the newspapers, I see that there are only eight low-powered aeroplanes available in the United States Army for service in Mexico; therefore, I respectfully request that you consider the following offer: I will lend the aviation division of the Signal Corps one of our type 'H,' 130-horsepower military tractor biplanes, fully equipped, for service in Mexico.

"The speed of this machine is 85 miles an hour; its range of flight, 4½ hours; its climbing speed, 3,000 feet in 7 minutes, 27 seconds. This machine has been declared by representatives of five Governments to be the best they have seen in America. In its official tests here and abroad, it exceeded the performance of any other American aeroplane. This type of machine has been used extensively in different services and has been declared to be a decidedly satisfactory product of this horsepower and carrying capacity.

"Should you consider this offer favorably, I will be glad to take up the details and if you so desire, to procure pilot or mechanics."

Sergt. Elliott C. Cowdin at Verdun

Sergt. Elliott C. Cowdin, a New Yorker, who is with the French Army, near Paris, has just succeeded in having himself transferred to that branch of the army which is defending the French positions about Verdun.

Until a few days ago Sergt. Cowdin, like Sergts. William Thaw, Norman Bruce and other American airmen, was attached to the reserve of the French army aviators and stationed near Paris, awaiting the organization of the long-heralded all-American flying squadron. Although it is likely that this squadron, composed of twelve or fourteen Americans, will be ready for the front within a fortnight, Cowdin grew tired of doing nothing and determined to get to the battle around Verdun. When permission to attach himself to the squadron of that sector reached Cowdin, he exclaimed:

"Thank heaven! I am going where there's something doing. What's the use of being a French army aviator if you can't be in the biggest scrap the war has produced?"

Two Americans, C. C. Johnson, of New York, and H. C. Balsley, of San Antonio, Tex., recently have been enrolled in the flying corps charged with the defense of Paris. This distinction entails risky duty. The airmen of the corps have to make nightly flights over the city.

Anthony Jannus Returns From Russia

Anthony Jannus, a representative of the Curtiss Aeroplane Company and himself an aviator, who returned on the American liner St. Paul, after a long stay in Russia, said that one of the greatest triumphs the aeroplane had achieved during the war was the control of the Black Sea which it had given to Russia.

"It is the first time in history," he said, "that physical control of a large body of water has been maintained by the air. Russia now possesses a magnificent equipment of aeroplanes, both of the scouting and the battle plane type. The Russian Navy has done fine work in the Black Sea, but the great fleet of aeroplanes which Russia has there has made it almost impossible for a Turkish ship to make a few miles along the coast from one Russian town to another. Practically every Turkish ship that attempts to move in the sea in good weather is observed by an aeroplane. If the ship is not destroyed or driven back to its harbor by bombs, the aeroplane within a short time has several Russian warships in pursuit of it."

Mr. Jannus said he was on a Russian ship when the Turkish Black Sea port of San Godac was bombarded and destroyed by bombs dropped from aeroplanes. He said a Turkish submarine had crept up unobserved on a Russian seaplane which was resting on the surface, and launched a torpedo, which grazed one of the planes of the airboat but did not explode. Before the submarine could dive he said that the air-boat rose and destroyed it with bombs.

"Hundreds of thousands of people have been brought to Petrograd by the war industries, and hundreds of thousands of others to escape from the privations visited by the war on some of the provinces," he said.

Warning

The prosperity which has come to the aeronautical industry during the past few years has stimulated unscrupulous persons to form companies under high-sounding names primarily for the purpose of "fleecing" the young men who read and are attracted by their literature. Usually the activities of these companies are along the line of preparing students for the various branches of the government service.

Their appeal usually starts out, "the demand for young men to enter the field of aviation has become so great that we have established the .... for the purpose of training young men who wish to enter this fast growing field of industry, where opportunities are unlimited, for commercial and governmental positions."

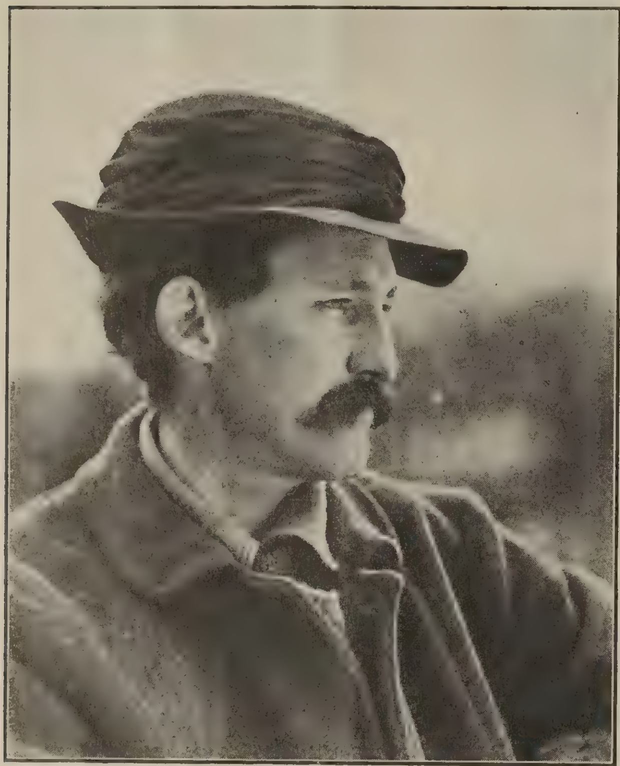
Invariably a prophetic picture is sketched of the vast number of pilots which our military and naval authorities will shortly require, and while it is not definitely stated, the impression is usually conveyed that the officers of the tuition school can "pull strings" to get their students a preference in the positions available.

Many well-meaning young men have lost their money in such enterprises, and we would advise all those contemplating a course in aviation to communicate with the secretary of the nearest Aero Club, or to send a letter direct to the office of Aerial Age, where we shall be glad to make investigations and offer suggestions.

At the O. E. Williams Aeroplane School. Left to right, O. E. Williams, R. F. Armstrong, E. Junken, Battle Creek; Al Bosheck, Scranton; R. North, Windsor; Tony Hazel, Detroit

THE BURGESS COMPANY EXPANDING

IN view of expanding business and the prospect of a still further increase, it has been found necessary to make extensive alterations and reorganization of the plant of the Burgess Company at Marblehead. As a result the capacity will be raised from one to two or three machines per day. Since 1909, when the first Burgess aeroplane was constructed,



W. Starling Burgess

in what was then a boatshed, with the aid of half a dozen men, the concern has grown to a point where it occupies twelve buildings with a high-water payroll exceeding 200.

The alterations in the main shop comprise an entire reconstruction internally, including a cement floor as base for the heavy machinery, the rearrangement of the equipment along lines designed to cut down to the last possible degree waste of time, and the installation of the latest apparatus invented for the use of aeroplane producers.

Another new feature included in the improvement of the plant is the recently constructed hangar for launching machines for flights from the harbor surface. This structure, with a width of sixty and a depth of 100 feet, will easily house two machines. Its most notable and interesting contribution, however, to the science of handling aircraft lies in its provision for putting aeroplanes overboard.

This is considerable of a problem at Marblehead owing to the deep water in the harbor, and the tide which ranges from ten to thirteen feet. A marine railway, the method hitherto used, is slow and difficult, demanding as it does, that the machine be navigated into a narrow slip, the sides of which threaten the safety of the wings, especially when the operation is performed in a strong wind.

The new hangar does away with this trouble by dropping the aeroplanes directly in the water. Suspended lengthwise from a steel framework under the roof of the shed is a track with a roller carriage. This carriage is run to a point over the machine to be launched and a chain hooked to a point directly over the center of gravity. A geared-down roller carries an endless chain, by which the aeroplane can then be lifted from the floor of the hangar with slight exertion, so little, in fact, that one man, with one hand, can perform the operation.

When clear of the floor, the machine, carriage and all, is run along the track to a point over the water, the track extending out some fifteen or twenty feet of the front of the building. Once more the endless chain is brought into play, and the aircraft is launched. The entire operation requires far less time than is required to tell about it. After returning from a flight the aviator can run his machine up under its own power close to the wharf on which the hangar stands, the lifting chain is hooked in, and the aeroplane brought in in no time.

Outside work of the Burgess Company has been badly hampered by the severe weather conditions, which have greatly delayed trials of the Navy school machines. The squadron of six has been completed, and shipment to the Navy Aeronautics Training Station at Pensacola only awaits the outcome of the builder's trials.

Despite the gales, heavy snowstorms and ice conditions in the harbor, Aviator Walter E. Johnson, of the Curtiss Company, has made a number of flights, and reports that the machine, in the air, operates as easily and as satisfactorily as could be desired. As yet, however, it has been impossible to make speed and climbing tests under full load conditions.

The photograph which appears elsewhere in these columns gives an excellent idea of the appearance of the school machine. The overhanging upper surface, with ailerons on the top wing only, and the carefully streamlined fuselage, are noteworthy features. The simplicity of the system for supporting the machine on the pontoons will also be noted.

A task of considerable magnitude has been laid on the Burgess shops in the production of twenty huge boats for the aeroplanes under construction for the Allies by the Curtiss Aeroplane and Motor Company, of Buffalo. As has been announced, these will be by far the largest craft of the heavier-than-air type ever constructed. The order calls for a flotation of about 30,000 pounds, giving some idea of the tremendous size and weight of the machines.

The Burgess - Dunne Seaplane built for the U. S. Navy

The Detroit Gas Turbine

THE Holmes-Colbert Engineering Company, of Detroit, Michigan, has recently created a good deal of interest in the aero engine field by the announcement that they have developed a gas turbine for aeronautical uses. AERIAL AGE has just secured the first description of the engine offered for publication, and we have pleasure in reproducing it herewith:

"During a period of about five years, extensive experiments were conducted with exploding gases which were directed upon the outer rim of a rotor for the development of larger volume of power than was possible to secure from that of a piston.

"It is a well-known fact that the steam turbine secures its immense power within a comparatively small space. The steam, however, as generally supposed, is not driven onto the rotor in a steady stream, but by puffs or impulses. These impulses have a tendency to provide a more compact power and more of it than a steady stream, in addition to its being much more economical.

"Upon this principle the Detroit gas turbine is founded. It was found that the compression of gas at about 90 lbs. per square inch could be perfectly controlled and carried to the point of utility where it could be ignited and driven through a nozzle upon the rotor at an enormous pressure, this charge of exploded gas remaining in a compact and ever expanding mass.

"It was found by continued experiments that the full efficiency of the possible mechanical power of the exploding gases could be secured by permitting the rotor to revolve at an unrestricted speed of 400 feet per second at its periphery. This, of course, would mean a prohibitive speed for the driving shaft, but the reduction of the ratio would provide for a more constant speed driving shaft.

"The absence of friction of the rotor, of course, permits of a high velocity and the constant stream of red hot gases upon the rotor has no ill effects upon it. No lubrication is required there.

"The motor consists of an eight compressing cylinder unit for supplying the compressed gas to the firing chamber. Each cylinder supplies a complete charge at each revolution, in all eight impulses or puffs at each turn of the driving shaft. Since the speed of this driving shaft will ordinarily be 3,000 r.p.m., this will mean approximately 24,000 explosions or impulses per minute upon a 23-inch rotor. As each explosion directs its energy upon seven and three-quarters square inches of rotor surface at a constant pressure of about 115 pounds per square inch, the vast difference between applying power in this manner and by means of a piston can be readily determined.

"The correct application of the gases to the rotor depends absolutely upon the correct form of the nozzles and the rotor vanes, and the way in which the force is deflected from one rotor member to another. This is done in exactly the same manner as with the steam turbine and there is not a whit of difference in the application of the impulses.

"The elements that were necessary to consider and conquer were the controlling of the compressed gases, with their correct application in exploding and the lubrication, all of which have been successfully solved with this turbine. The mechanical details are taken care of in a way most suitable to the requirements.

"The comparative small piston displacement of the gas compressor enables it to consume but very little fuel in delivering its maximum output—in fact, a well-known automobile motor consumes 40 per cent. more fuel at corresponding speeds, while it delivers only a fraction of the power. This immense power is derived by directing the full and confined force of the exploding gases upon the rotor without any possibilities of losses or leaks.

"It has the advantage, too, of being absolutely self-contained and operates perfectly without the aid of any outside agency.

"Each accessory is of standard manufacture and every part is readily accesssible.

"The turbine is water cooled, the lubrication is force feed, every part being thoroughly lubricated without waste, and the entire arrangement is automatic.

"There are no restrictions to its endurance, and with ordinary care should outlast any other type of motor.

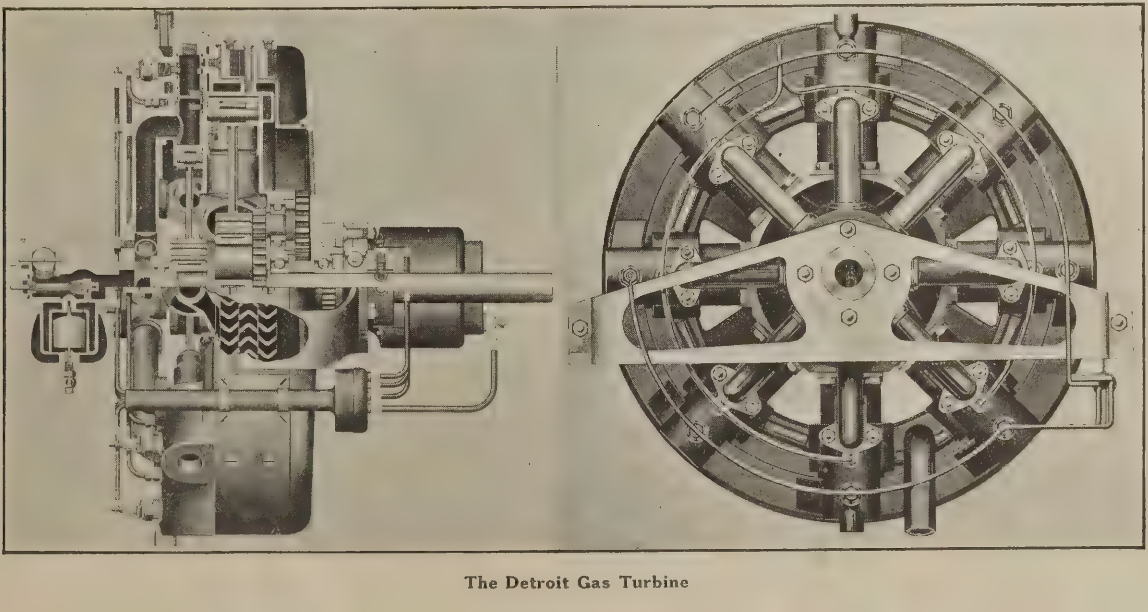
"The turbine is mounted upon a skeleton frame, which is shown in the illustration and forms a very compact power plant. The space occupied is very small in comparison with other motors and the weight is but a fraction of that to be found in the reciprocating type. The 200-horsepower turbine will weigh 345 pounds complete.

"The Detroit Gas Turbine Corporation is a strong financial company in the million dollar class, with their home offices in Detroit. While progress has been slow in getting under way, there will be no time lost in making shipments of the immense volume of business now available, reaching into the millions of dollars.

"At the present time only three models will be furnished, 100, 200 and 300 horsepower units, but provisions are being made to soon supply 500 and 1,000 horsepower turbines, all models of which will be constructed upon the same general plans and principles.

"The Detroit gas turbine is the product of the Holmes-Colbert Engineering Company, of Detroit. Both E. R. Holmes and B. Colbert are experienced in their particular branches of science and engineering ability and through their association quickly reached a more definite plan of action, which produced the results. Mr. Holmes has been associated with leading engineering establishments of both the East and West, and Mr. Colbert has been identified with scientific research work both in the North and South. His more recent operations have been in Detroit, prior to which his headquarters were Pine Bluff, Arkansas.

"Those who have become more prominently associated with the Detroit Gas Turbine Corporation are Mr. Gordon N. Peay and Mr. Rogers Young, both influential men of Little Rock, Arkansas. Mr. Peay is president of the W. B. Worthen Company, bankers, of Little Rock, being associated with this firm for more than a quarter of a century. He is chairman of the executive board of the corporation. Mr. Young is a capitalist and a leading citizen of Little Rock and is treasurer of the corporation."



The Detroit Gas Turbine

REPORTS IN WIND TUNNEL EXPERIMENTS IN AERODYNAMICS

I. The Wind Tunnel of the Massachusetts Institute of Technology

By J. C. HUNSAKER

Assistant Naval Constructor, U. S. Navy
Instructor in Aeronautics, Massachusetts Institute of Technology

(*Continued from page* 19)

The standard National Physical Laboratory Pitot tube was mounted in the center of the tunnel in the place where models are tested. This tube was connected to the Chattock gage. The side plate in the wall opposite the tube was then connected to the alcohol gage. The wind speed was then adjusted to 2, 4, 6, 8, etc., up to 40 miles per hour and both gages read. Some 100 readings were taken. From the Chattock gage readings the true speed was taken from its calculated curve (for standard air). The readings of the alcohol gage were then plotted on true speeds. The curve so made was then a calibration of the side plate and alcohol gage in combination. The Pitot tube and Chattock gage may now be removed, and in future

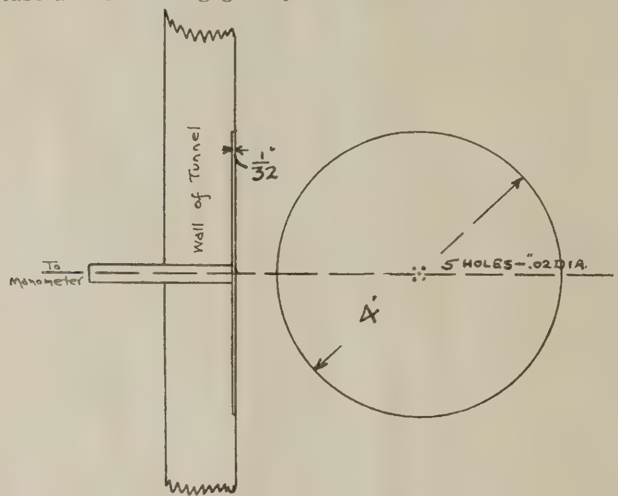


Fig. 1

model testing the alcohol gage readings may be used to measure the velocity at the center of the tunnel.

It is shown below that the velocity over the section varies about 1 per cent over a 2 foot 6 inch square at the center of the tunnel.

Chattock Micromanometer

The Chattock gage mentioned above has been adopted as our laboratory standard, but is used only for the calibration of other gages which may be preferred on account of ease of reading. The following notes on this gage are introduced here in the hope that someone may have use for a delicate pressure gage. Working drawings will gladly be supplied to anyone contemplating the construction of such a gage.

The Chattock micromanometer was devised by Professor A. P. Chattock and Mr. J. D. Fry for the precise measurement of very small pressures. The gage is described by Dr. T. E. Stanton in the *Proceedings of the Institution of Civil Engineers,* December, 1903. Dr. Stanton used this gage in his experiments on the air resistance of small plates.

The principle of the gage is that of the inclined liquid U-tube, but instead of giving the tube an initial pitch and observing the change of level of the liquid, the Chattock gage is fitted with an elevating screw and micrometer by which the gage is tilted to balance the pressure difference in its two ends. By reading on the micrometer the amount of tilt given, the head in inches of liquid is computed. By this means there is no motion of the liquid in the glass, and errors due to capillarity and viscosity are eliminated. Furthermore, the condition of the surface of the glass has no effect.

The gage (pl. 5 and fig. 2) consists of a glass U-tube mounted on a tilting frame *T*. The pressures to be measured are connected to the bulbs *A* and *C*, which are in communication with each other through a horizontal tube bearing a third bulb *B* at any intermediate point. The bulbs *A*, *C* and the lower part of *B* are filled with water. The upper part of *B* is filled with castor oil. The water in *B* and *C* is in free communication and hence the oil in *B* is at the pressure of *C*. The water in *A* is led through a thin walled tube through the bottom of *B* extending into the castor oil. An excess of pressure in *A* over the pressure in *C* will cause water to flow from *A* into *B*. A water bubble will then grow at *D* and expand into the oil. The gage can be tilted so that this bubble remains of uniform diameter. The pressures in *A* and *C* are then balanced. To provide this tilting the manometer proper is mounted on a tilting frame *T*, which pivots on the knife edges at *G* and is elevated by the screw *F*. The whole is carried on a bed frame *Z* fitted with three leveling screws *I*, a retaining spring *H*, and a scale *S*, on which may be read the full turns of the screw *F*.

A microscope, *M*, fitted with cross-hairs is mounted on the frame *T* and directed at the bubble *B*. A small mirror on the opposite side illuminates the surface of the bubble.

The screw *F* is fitted with a large drum divided into 100 parts. The screw has 20 threads to the inch. The gage is sensitive to one-half of a division on the drum, and hence to a movement of the screw of 1/4000 inch.

Before a measurement is taken, the bulbs *A* and *C* are opened to the air of the room and the frame tilted by moving the micrometer until the top of the bubble *B* is brought tangent to the horizontal cross-wire of the microscope. This is the zero reading. The bulbs *A* and *C* are then connected to the two parts of a Pitot tube and the frame tilted until the bubble is again on the cross-wire. The amount of tilt is then read on the micrometer.

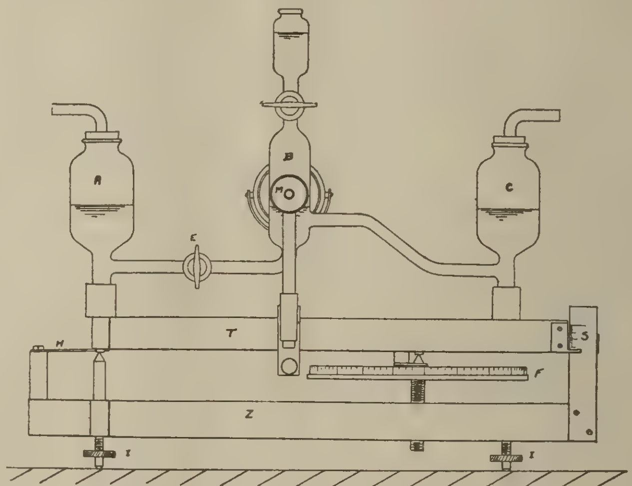


Fig. 2.—Chattock micromanometer

Naturally too wide an excursion of the bubble will result in its rupture. The loss of a bubble transfers a drop of water from *A* to *B*, and hence a new zero reading must be found by balancing up again. To avoid sudden change of pressure and breaking of the bubble, a stop-cock at *E* is fitted. This cock can be closed to make the instrument portable, and in taking a reading an approximate balance is made with *E* partly opened. The cock is then opened full.

The gage is filled with a solution of salt and water of s. g. 1.06. The addition of a little salt keeps the castor oil from growing cloudy.

Two gages were constructed, one by a skilled glass blower and the other by a student, with a view to determining the effect of workmanship and dimensions. The frame and stand were made identical in the two gages, but the glass work was purposely altered. The tip of the tube at *B* was ground to a knife edge in one gage and in the other ground off square. One tube was .20 inch in diameter and the other .15 inch in diameter.

The two gages were connected to the same static pressure and gave readings identical to 0.25 per cent. It was found that the gage in no way is affected by minor variations in workmanship.

In the gage with the ground knife edge tip it was found that the bubble did not break so readily as in the gage with the square tip. It was suggested by Professor Gill that the tenacity could further be increased by coating the outside of the tube below the bubble with paraffin. This was tried and was found to be of great assistance. A height of bubble from three to four times the diameter of the tube at its base could be allowed without rupture. The reason for this is to be found in the fact that castor oil sticks very tight to glass, but will not stick to paraffin. By the use of this wax the bubble could not creep over the edge of the tube and so slide down it, causing a break. However, any large excursion of the bubble is to be avoided as tending to cause a slight change in the zero reading. In all tests the zero should be taken at intervals. The effect of the paraffin on the tip could not be detected in the readings of the gage.

The consistency of the gage readings with these various alterations in the base of the bubble, as well as in the size of the bulbs and connecting tubes, gives great confidence in this type of gage. It was not possible to calibrate this gage experimentally because there was no other gage available to measure it against which it was equally sensitive. However, we have Professor Chattock, Dr. Stanton and the National Physical Laboratory as authority for the calibration of the gage by calculation from the dimensions of its parts, and the density of the liquid. It may be noted that the density of the oil used has no effect on the principle of the gage and is not considered.

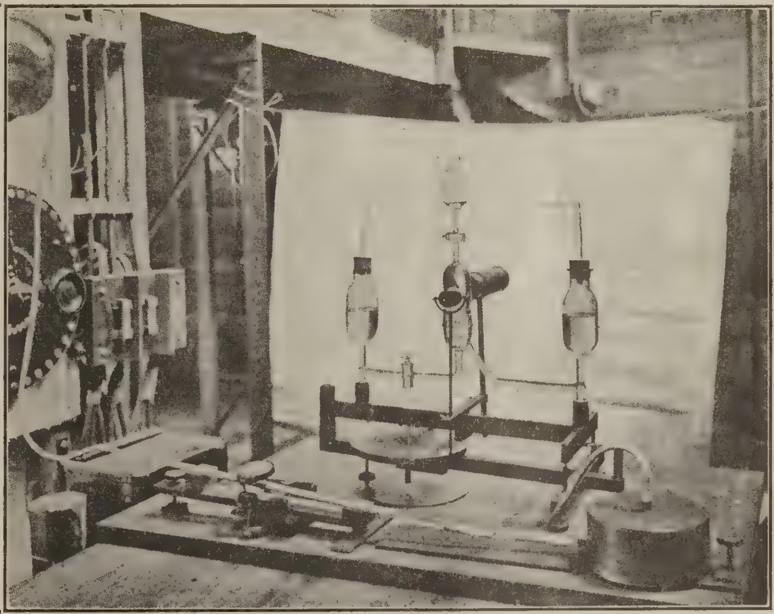
For the calculation of tilt, it is then necessary to measure the distance between the centers of the bulbs A and C and the distance from the knife edge G to the screw F. An error of 0.1 inch in either of these measurements is an error of 1 per cent in head or 0.5 per cent in velocity. There is no difficulty in getting these distances to the nearest hundredth of an inch. The screw thread was cut so precisely that it was impossible to detect any error in the pitch of the thread. The hole in Z was tapped with a standard Brown and Sharp tap. The calculation of the change in level of the surfaces of the liquid in A and C is precise to 0.1 per cent. The density of the solution was taken on a Westfall balance to the same degree of precision.

Since the gage is sensitive to less than 0.1 per cent for heads of more than 0.3 inch, the measurement of velocity depends on the precision of the Pitot tube. The latter is good to probably 0.25 per cent in velocity. However, the air current always has some fluctuation at high speeds, so that in the end the velocity measurement is limited in precision by the closeness with which such fluctuations can be averaged. In a very steady current, such as our wind tunnel, it was found that the error in estimating velocity was less than 0.5 per cent. The average of a number of observations is of course better than this.

Change in density of the salt solution is 1/3 per cent for a change of 60 degrees F. in temperature. A temperature correction is ordinarily unnecessary.

An alcohol gage is a sensitive and consistent instrument, but requires calibration to eliminate errors due to viscosity and capillarity. The question of its suitability for precise work will be discussed later in another paper. It has the great advantage over the Chattock gage in that it requires no delicate manipulation to get a balance, no cross-wire and microscope, and with it it is possible to estimate the mean of fluctuations. The alcohol gage has been successfully used to measure air speeds as low as two miles per hour. It is shown with the Chattock gage in plate 5.

Chattock Gage and Alcohol Gage, used for velocity measurements



Hugh Robinson Foreman at Curtiss Aeroplane Plant

Hugh Robinson, who is general foreman at the Curtiss Aeroplane Company's plant in Buffalo, is seeing the realization of many of his dreams of long ago. As foreman he supervises the shipping of aeroplanes and the number is sufficient to gladden his heart and make him feel that, after all, he was not a dreamer when he expressed his hopes, years ago, that he would live to see the time when there would be factories turning out aeroplanes by the hundred. Another dream of Robinson's which is being realized, was that of seeing mail carried by aeroplanes. It is to be remembered that Robinson, in 1912, carried mail down the Mississippi from Minneapolis to Rock Island, a distance of three hundred and seventy-five miles.

A. J. Engle in Charge of Model T Curtiss Flying Boat

A. J. Engle is one of the proudest men in the Curtiss factory these days. Being in charge of the construction of the Model T, fifteen-ton aero cruisers, is his reason for feeling that he is making history every day.

Doherty Decorated by Italian Government

Elwood N. Doherty, an American aviator employed by the Curtiss Company at Buffalo, has received notice that he had been decorated by the Italian government for his services in instructing the Italian naval flying corps during the last year. The decoration is equivalent to the bestowal of knighthood in England.

Doherty recently married here Miss Gladys Champlin, daughter of Mr. and Mrs. Harry M. Champlin, of Hammondsport, N. Y. The couple have gone for a six weeks' honeymoon trip in Spain. Thence they will go to Italy, where Doherty will receive his decoration.

Robert Dunn in Mexico

Robert Dunn, author, explorer and war correspondent, has been engaged by the New York *Tribune* to accompany the expedition into Mexico. He was with the naval expedition to Vera Cruz and on the first aerial scouting trip over the city and environs he was permitted to accompany the army aviator. This was the first aerial trip ever made by an aeroplane of the United States government into a hostile country.

FOREIGN NEWS

By JAMES E. CLARK

BELGIUM

A fleet of sixty-five Allied aeroplanes, so far as available records show, the greatest aerial fleet that ever made a raid, bombarded Zeebrugge and Houttave on March 20. Zeebrugge is on the Belgian Coast twelve miles northeast of Ostend. Since the German occupation this port has become of considerable importance, particularly as a German submarine base. It is one of the principal points from which submarine operations in the North Sea are directed.

The machines carried on an average of 200 pounds of explosives. In other words about six tons of death dealing bombs were dropped upon the enemy in the early hours of the morning. All of the airships returned to their stations without damage, and with the exception of one Belgian officer who was badly wounded, the entire corps escaped.

GERMANY

Dispatches from Amsterdam report that aeroplanes of the Allies have not long since made a successful raid on Essen, where is located the famous Krupp gun manufactory. Six sheds are said to have been destroyed. The town of Gladbach, 139 miles southwest of Essen is also reported to have been attacked at the same time. This raid on the Krupp works is indicative of the increasing range of the war aeroplane. Essen lies 170 miles northwest of Verdun and has heretofore been reached by aeroplanes from the lines of the Allies. The amount of military damage inflicted during the initial raid is unknown but according to a single item in the annual report of the company, given some time ago, the first raid was not without effect. The newspapers of both Paris and London have demanded that air raids be made on the Krupp works for the destruction of this plant would tremendously cripple the German army, a fact that is frankly admitted by German officers.

The official bulletin of the German war office denies that the Krupp works were damaged in the latest air raid and declares that the reports are "pure inventions."

In connection with the operations in the vicinity of Verdun, Berlin claims some aerial successes. A recent bulletin said:

"After much reconnoitering, our airmen attacked enemy railway stations and military depots, especially on the Clermont-Verdun railway line, with success.

"Three enemy aeroplanes were destroyed in the Champagne and one in the Meuse region."

GREAT BRITAIN

The principal feature of the raid which was made by four seaplanes on England on Sunday afternoon, March 19th, was the conspicuous gallantry of Flight Commander Bone, Royal Naval Air Service, who pursued one of the invaders thirty miles out to sea, forced him to give battle and after an action lasting a quarter of an hour, killed his adversary and sank the aeroplane in the ocean. The four raiders appeared over Kent and travelled in pairs. A total of 48 bombs were dropped. Nine persons were killed and thirty-one injured in Dover, Ramsgate and other towns.

Among a long list of awards published last week in London appears the name of Aviator-Lieut. Grenfell who receives the military cross for attacking single-handed and bringing down three Fokker aeroplanes.

Lord Montagu of Beaulieu has accepted membership in the new Air Committee of Great Britain and it is expected that eventually he will be made director of the air service and receive Cabinet rank. With the organization of the Ministry of the Air there is general expectation that new vigor will be put into this branch of the nation's defenses. Lord Montagu is said to have been impressed for years with the importance of Zeppelins and he will insist on the construction of a fleet of airships of this type. In a recent address before the Constitutional Club Lord Montagu declared that a fleet of Zeppelins could accompany a hostile fleet and direct strategic movements and so direct and aid the enemy fleet that Britain's naval supremacy might be neutralized. Mr. Johnson Hicks, supporting Lord Montagu of Beaulieu, said if England had ten airships of the Zeppelin type he guaranteed by sending them over the Kiel Canal and Wilhelmshaven the German fleet would be forced to fight within a week.

In a debate in the House of Lords, Lord Montagu said: "The present position of our air service is unsatisfactory. In twenty-five Zeppelin raids not one machine has been brought down by our anti-aircraft guns. Our system or our guns must be replaced and greater efficiency must be found."

Lord Lansdowne, speaking for the Government, said in reply to these attacks that the monthly output of aeroplanes in England is now twenty times greater than in peace time, and would be double during the coming summer. He added:

"At the end of this month the strength of the squadrons was eight times that of the aerial force that accompanied the expeditionary force in 1914. Every precaution is being taken to meet the Zeppelin danger."

Capt. G. C. Nicholson, only son of Sir Charles Nicholson, member of Parliament for Hampshire, was killed while making a flight in England. He had seen several months' service at the front.

GREECE

A Zeppelin raid on Salonika on the night of March 18th proved to be a failure. The airship approached the city early in the morning but was seen, as the moon was shining brightly, and the artillery fired upon it incessantly, compelling it to turn back. A number of bombs were dropped but they did no damage. The German official report says that the Zeppelin attacked the Entente fleet near Kara Burnu, south of Salonika, but makes no mention of any results that followed.

FRANCE

The death of Lieut. Cabanes, who had been assigned to the position of observer in the aerial force of the French army illustrates the dangers that attend a pilot when his observer is mortally wounded. Invariably and instinctively the wounded man will seize his comrade in a death grip which jeopardizes the life of the latter. Cabanes had had a year's actual service in the artillery. Upon his transfer to the aerial corps he had obtained a leave of absence to visit his home. With a few hours to spare before departing on his furlough he asked permission to make a flight over the sector which was henceforth to be his field of operations. The request was granted and he went with a dependable pilot. Soon they went through a storm of shrapnel. Undisturbed by this Cabanes cooly made notes in his book of the location of the batteries. Swinging out of this danger zone they encountered a Fokker. In the fight which followed the French aeroplane was riddled and Cabanes was hit while standing at the gun. He fell over the shoulders of the pilot, gripping him desperately, and the blood gushing from his mouth added to the terror of the moment. The pilot himself had been struck and had but one arm with which to control the machine as the Fokker pursued and continued to shoot. After a time the pilot with a mighty effort succeeded in throwing off the body of his comrade and at a terrific angle dove for safety, hoping to lead the German over a battery of anti-aircraft guns. The latter presently discovered the danger and retreated. Then, instead of landing at the most convenient spot, the heroic pilot flew to a point where he knew immediate medical attention might be given to his comrade, if there was still time, but when they lifted Cabanes from the machine, as the revellie was sounded, they saw that he was beyond aid.

The tremendous activity of the aerial forces co-operating in the prolonged engagement in the Verdun region is suggested, rather than reported in the bulletin of just one day issued by the Army Headquarters. It reads as follows:

"Our aviators display remarkable activity in the whole Verdun region. A squadron composed of six aeroplanes dropped 130 shells on the strategically important station at Brieulles, north of Verdun. A large number of engagements were fought, in which we had an incontestable advantage.

"In the course of these combats three German aeroplanes were brought down, one of them in our lines and the two others inside the first German lines. Other aeroplanes were observed in the act of falling, but their destruction has not been established.

"During the course of a night fight a group of French aviators threw down thirty shells of large calibre at the railroad station of Conflans. Flames were seen breaking out at five different points. In spite of a violent cannonade all the French aeroplanes succeeded in getting back without suffering damage."

Eighteen aerial engagements in one day in the region of Etain were reported not long ago by the French headquarters with the significant statement that in each case the Germans were put to flight. About the same time Sub-Lieut. Guyemer brought down a German aeroplane which fell in flames within the French lines near Thiescourt—the eighth victory of its kind credited to Guyemer. Six of the enemy aviators whom he vanquished fell within the French lines and two within their own lines. On the day of Guyemer's latest victory another German aviator was also brought down within the French lines near Dombasle in the Argonne. In his latest encounter Lieut. Guyemer was shot down by a German airman, being wounded on the face and hands, but he landed within his own lines.

The first officer of the Norwegian bark Silius which was sunk at Havre expressed the opinion in Paris that his ship may have been struck by a bomb from an aeroplane instead of by a torpedo from a submarine.

Count Jacques Decazes, military aviator and brother of Duke Decazes, has been killed in an air battle. He had just succeeded, after a long duel, in bringing down a German aeroplane when his own machine was struck by an inflammable dart, fired by another German aeroplane. The Count's machine burst into flames and fell within the German lines.

A touch of romance is given to the tragedy of the Zeppelin brought down in France a few weeks ago, by the finding in the wreckage two slender feet clad in high-topped, fashionable kid boots. From this discovery it is thought that there was a woman aboard the airship.

The greatest aerial battle of the war took place last week when twenty-three Allied aeroplanes raided Mulhausen, Upper Alsace. More than fifty machines fought at close quarters and at one stage of the battle the crews manning the German anti-aircraft guns had to cease firing for fear of hitting their own aeroplanes. Thousands of persons witnessed this spectacular battle. One French airman rammed a German machine, which fell in flames. Five German aeroplanes, and three French fell, the occupants of all being killed. Even while the allied airmen were fighting they dropped a number of bombs upon military positions.

ITALY

After the last raid over the provinces of Ferrara and Ravenna it was found that the Austrian aviators had dropped a quantity of sweets wrapped in red and blue paper. The military commander at Bologna publishes the result of a chemical analysis from which it appears that the sweets were a compound of starch, sugar and infectious germs. None of the sweets had been eaten by those who found them and the effort to cause disease failed.

RUSSIA

German seaplanes recently dropped bombs on a Russian squadron of one battleship and five destroyers and on several Russian merchant ships in the Black Sea near Kali Akra Cape, on the coast of Bulgaria, about twenty-five miles northeast of Varna. Some of the destroyers were hit. Despite heavy shelling from the Russian warships, the communication adds, the seaplanes returned safely.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

DETROIT AERO RESEARCH AND MODEL CLUB
c/o William P. Dean, 1717 Concord St., Detroit, Mich.

BUFFALO MODEL AERO CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Illinois Model Aero Club

By Arthur E. Nealy

On Saturday, the 11th of March, members of the club turned out for the first official meet of 1916. The day, the machines and the distances covered were all impressive. But greater than anything else, the fact stands out that three records were broken, two of which will stand as world's. There was a tremendous wind blowing, as there nearly always is at this time of the year, but it was fairly steady and might have been said to have aided rather than handicapped the flying. Mr. Ward Pease, with a twin push ROG, flew a distance of 3,364 feet with a duration of something over 2½ minutes. The duration must stand as being unofficial as the timer lost sight of the model at the end of this time. After a short search the riser was found far beyond the limits of Cicero flying field between a couple of houses and the distance measured by tape.

The second world's record was made by Mr. Donovan Lathrop, well-known tractor builder and already a model flyer of the world record calibre. The latter's ROG tractor traveled 1,035 feet. Mr. Lathrop's same flight made a duration of 58 4/5 seconds, which stands as the single-tractor duration record of America.

Following this Saturday, Mr. Lathrop on Sunday made an unofficial tractor world's duration record of 95 seconds. This with a ROG. A meet was also held on the Saturday following, the 18th of March, but although more than fifteen members were out, no spectacular flights or records were broken. The Mozart Cup, which goes to the breaker of world's model records, is having a hard time of it these days hunting for its rightful owner.

At the last meeting of the club Mr. Lathrop gave a description of tractor building that interested old and new members greatly. Mr. C. R. Borkland, vice-president of the club, presided at the meeting of March 17th.

Mr. Joseph Lucas, 1st vice-president, has been called to Grand Rapids, Michigan, and is rebuilding a Benoist flying boat in that city.

Aero Science Club of America

At the last meeting of the Aero Science Club, the following was agreed upon: That the Aero Science Club will be willing to assist in every way possible any person desirous of entering the National Model Aeroplane Competition. That is, if any information is desired by any person wishing to build a rubber strand driven model or a mechanically driven model he can secure such information by addressing the Information Department. And in so far as the members of the club are fully conversant with compressed air motors and rubber strand driven models, valuable suggestions can be offered on either one of these subjects. Secretary, 29 West 39th Street, New York City.

The Franklin School Model Aero Club

On Friday, March 20th, the Franklin School Model Aero Club held its second meeting. During the meeting a number of models were exhibited by members who have had but little experience, but who are rapidly adapting themselves to this new sport. It is the hope of the members to be able to have a number of good machines ready for the coming contests and to this extent they are bending every effort. At the coming meeting some new models which are now in the course of construction will be exhibited by other members. Further instructions as to the construction of models will be given by Mr. Cavanagh, who is representing the Aero Science Club at the next meeting. For further particulars address the Secretary, Y. M. C. A. Building, Orange, N. J.

An Electrical Equipped Model

During the past few years many attempts have been made to fly model aeroplanes at night and many different schemes have been tried whereby it might be possible for the flyer to locate his model after it completed its flight, or to be able to follow it during its flight. Up to the present time the most successful method of illuminating the model for night flying is by the use of "Chinese punk." The "punk" is broken up into many pieces, the pieces being attached to the main wing along the entering and trailing edges and just prior to the launching of the model the "punk" is lighted. By this method the flyer is enabled to trace his model to the spot where it landed not alone by the lights but by the odor which is emitted by the punk.

But through the courtesy of Mr. A. H. Wheeler, President of the Oxford Model Club, we are informed of a new method of equipping a model with an electric light which not only enables the flyer to detect his model after its flight but also makes a very pretty sight, throwing into bright relief as it does the front portion of the model with its white frame and elevator. The model which is shown in the accompanying photograph is the "Night Flying Record Holder" of the Oxford Model Club. This model has made a duration of approximately 85 seconds, carrying the electrical equipment as shown.

The complete lighting outfit weighs but three-fourths of an ounce including battery; the lamp used is 1.5 volt (as found in the regular electric lights using one No. 6 dry cell). The battery is one-half of a fountain-pen flashlight battery, a tiny knife switch is mounted on the back of the reflector base.

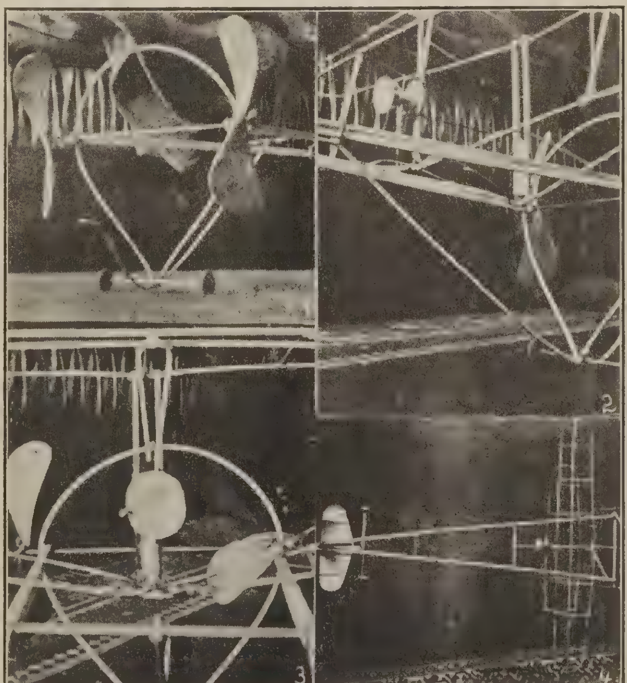


Fig. 1.—Rear Chassis of the model, showing expanding pitch propellers. Fig. 2.—Searchlight attached to the front upright strut with battery between the two rear struts. Not the hollow spars of the fusilage. Fig. 3.—Looking into the reflector from the point of the fusilage. Fig. 4.—Looking down on the electric lighted R. O. G. Pusher biplane model, searchlight attached to the front strut of the biplane section

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Zeppelinitis

Mr. Meek was not very well, and the doctor had advised him to take a glass of beer occasionally "for his stomach's sake."

"It can't be done, doctor; it can't be done," said Mr. Meek. "Although there is a barrel of beer in the cellar, my wife insists on my being teetotal for the duration of the war."

"Tut, tut," said the doctor, as he took his leave, "you must invent a way to overcome your wife's scruples; an easy matter enough, surely?"

A few days later the medical man received a visit from Mrs. Meek, who was greatly concerned as to the state of her husband's health. "I am afraid, doctor," she said, "that the poor man has had a nervous breakdown. He's continually fancying that he can hear Zeppelins, and goes to hide in the cellar; besides which he often appears to be somewhat strange and aggressive in his manner."

"Look here, Sam," said the aviation manager, in the course of an argument, "don't you believe that an honest man is the noblest work of God?"

"Well, sah, I'se done giben up de idea ob bein' de noblest work ob God; all I asks is to make a livin'."

DONE AGAIN.

Farmer Sleepypay—"Drat it! since them aeroplanes hev got comin' this way I can't git no weedin' done."

Substituted

"So you have taken to carrying around a monkey? This is going too far!" said the pilot.

"Well, you never go anywhere with me," was his wife's somewhat ambiguous retort.

He Had It

"Hullo, Tom! What's this I hear about your having some labor-saving device?"

"It's true, all right. I'm going to marry an heiress."

Not the Biggest

Mr. Spudd (angrily after listening to his wife denounce aviation)—I was certainly the biggest fool in the world when I asked you to marry me!

Mrs. Spudd (dangerously sweet)—Not the biggest, dearest, I accepted you!

Talk with Shaves

Bill to his friend, the wing expert—Can you shave yourself as well as a barber can shave you?

His Friend—I think so, but the trouble is I hate to talk to myself.

His Advice

Wife—One afternoon I win at bridge, and the next I lose.

Hub—Then why not play every other afternoon?

Hot Air

"I wish we were there. This aero-bus is getting close."

"Yes, and it will get closer as we get nearer."

First Mechanic—Strike me, then—I defy yer—strike me!

Second Mechanic—Ugh! I wouldn't flatter yer by altering the shape of yer face.

Overheard at the Aviator's Hotel

"Gee, but I had a funny dream last night."

"I know. I saw you with her."

"This is our latest novelty," said the aeroplane manufacturer proudly. "Good, isn't it?"

"Not bad," replied the visitor, "but you can't hold a candle to the goods we make."

"Oh! Are you in the same business?"

"No; we make gunpowder."

Teacher—You say the tendency of heat is to expand and increase and cold to contract and lessen. Can you give some familiar illustration of these effects?

Bright Pupil—The population of our seaside resorts.

Although rebuked many times, the aviator's inquisitive son persisted in asking questions.

"Pa, does ink come from the Black Sea?"

A moment later: "Pa, was Joan of Arc Noah's wife?"

Necessary

"I hear that they buried the janitor last week."

"Yes, they had to; he died."

"Jones is in the hospital very much run down."

"Nervous prostration or aeroplane?"

"Does you car smoke?" said the mechanic.

"Only when I try to back 'er."

AERIAL AGE WEEKLY

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Rear Admiral Fiske—A Real Patriot—Recommends Development of Aeronautics

REAR ADMIRAL BRADLEY A. FISKE is a real patriot and the country appreciates him. The fact that the present Administration has been against him on account of his faithfulness to his position has been noted and the Admiral has the country's sympathy and support. His statements before the Naval Committee on March 24 were widely read and the comments indicate that his position is fully appreciated and that there is a general disapproval of the attempts made by Secretary Daniels to suppress facts regarding the weakness of the Navy which the public should know.

With the horrible example of Army unpreparedness before us, we cannot help being dismayed reading the following excerpts from Admiral Fiske's testimony, when Congressman Britten got the Rear Admiral to the recommendations of the General Board as they came to the Secretary in the fall of 1914.

Mr. Britten asked how it happened that the recommendation of the General Board for an increase in the enlisted personnel of the Navy had been eliminated from the report of the Board.

"The Board eliminated it," replied the officer.

"But isn't it a fact that the Secretary refused to make the Board's reoort public if it contained the recommendation of the Board for an increase of 19,500 men?"

"It was for 19,600 men," corrected the witness. "Yes, that was correct."

"Well, what was the transaction and how did it take place? Weren't you the intermediary between the Secretary and the General Board?"

"I was," replied the officer, "and I took the report from the Board to the Secretary. The Secretary told me to take the report back to the Board and have that recommendation about the enlisted men eliminated, or there would be no publication of the report."

"And what did the General Board do about it?"

"Oh, the Board debated the point and came to the conclusion that it was important to have the report published for the purpose of educating the public, and that particular item might be left out, especially since in another paragraph there was an indication in general terms that the Board thought an increase in the personnel should be had."

"Didn't the Board decide that in the interest of the service the precedent of publishing the report would be a good thing?"

"Yes."

The records show that Secretary Daniels has shifted a number of good officers and placed them not only out of reach of the public hearing, but also in a position where they realized that a further shift would mean a drain on their financial resources, owing to the expenses connected with changing of headquarters and moving with a family. That forced them to silence on matters which the public ought to know.

In normal times Secretary Daniels's action could be called injudicious; at such critical times his attempts to prevent the building of a strong Navy make him dangerous. Judged from the standpoint of aeronautics—or from the number of submarines in commission—the Navy would be in the same plight as the Army is at the present if a Villa should appear at sea and bombard our coasts.

Fortunately Mr. Daniels's time is almost up, and, seeing that he has taken no steps to redeem himself, he will step out and soon be forgotten. It is to be hoped that the next Secretary of the Navy will perceive his duty, and with the co-operation of faithful men such as Rear Admiral Fiske, Dewey and Knight, will build a Navy equal to the best—which is what this country needs.

Asked by Representative Kelly to sum up his recommendations for explanation to the committee, Admiral Fiske urged these:

Development of a general staff through extension of the office of chief of naval operations, the officers in Washington to play war games, etc.

Increase in the enlisted men by about 25,000 *men.*

Construction of battle cruisers.

Development of aeronautics.

The last named item he thought more important than anything else, because he thought in a year's time the Navy could do more with aircraft to prevent invasion of the United States than anything else. The officer surprised the committee by saying that he did not believe it would be possible under any circumstances to develop by 1925 the greatest Navy in the world, as recommended by the General Board. He explained that it was one thing to build ships and enlist men and another thing to train and properly organize the material and personnel.

"Don't you think we ought to do the best we can this year without laying down any general declaration of policy?" asked Mr. Kelly.

"I think that wise. I would recommend that you build the ships recommended by the General Board, but I think you should do more for aeronautics if you can."

A Call for More Aviators

IN response to General Funston's call for more aviators and more aeroplanes for the Mexican campaign, the Aero Club of America has taken stock of the civilian and Militia aviators available immediately and those that will be available within six weeks to eight weeks. A list has been made and is being sent to the War Department, giving the names and particulars of nineteen aviators who have placed themselves at the disposal of the authorities and are training at the National Aeroplane Fund's expense, and are holding themselves subject to call by the War Department. The list also gives the names of the officers of fourteen states, whose expenses while training for aviation are being paid by the National Aeroplane Fund. A further list of aviators who would volunteer their service is being compiled to meet any emergency.

"These will also be trained as fast as the subscriptions to the National Aeroplane Fund permit it," said Mr. Alan R. Hawley, President of the Aero Club of America. "And as soon as the fund permits it, we will also equip the National Guard of New York with one or more high-powered ma-

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

chines, so that the most advanced of the twenty-two members of the Aviation Detachment can train with them."

The necessary number of trained aviators to form an aero corps is available—and the aviators are kept under training at the National Aeroplane Fund's expense.

"An aviator can never get too much training, particularly to meet the difficult conditions to be met in the Mexican campaign," said Mr. Alan R. Hawley, President of the Aero Club of America, when seen at the Club House, 297 Madison avenue. "For this reason, although Mr. W. Leonard Bonney has just returned from active flying in Mexico, we have sent him to the Curtiss School at Newport News to get a special course of training on the J. N. biplane, which is equipped with two motors of 90 h.p. Either motor will drive the aeroplane if the other stops, thereby safeguarding the aviator.

There are now Militia officers of 14 states under training at Newport News, whose expenses are paid by the National Aeroplane Fund, because the states did not have funds to send them there to take advantage of the offer of the Curtiss Company to train them free of charge. We were glad to have these Militia officers learn to fly, as they already have had military training, which is an advantage. In between six to eight weeks some of these officers will be able to pilot an aeroplane well enough to be of service as air scouts along the Mexican border, where conditions are not so difficult. They will, therefore, form a valuable reserve. If they are not needed for the Mexican campaign, they will continue their training and start aviation detachments in connection with the Militia of their own states."

The aero reserve being organized and trained by the Aero Club of America, to be kept in readiness subject to call by the War Department, has assumed substantial proportions, as is shown by the following list:

The heads of the Militia of fourteen different states were prompt in acting on the offer made by the Aero Club of America to pay the personal expenses of sending officers to the Curtiss Aviation School to take the course of training offered by the Curtiss Aeroplane Company and form a reserve of trained Militia officers to be available for service at the Mexican border.

The following officers were detailed to receive the course of training, the National Aeroplane Fund paying their expenses:

Arkansas

Brig. Gen. Lloyd England, the Adjutant General, has detailed Second Lieut. Forrest Ward to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Ward while taking the course.

Colorado

Brig. Gen. John Chase, the Adjutant General, has detailed Lieut. Cummings, Signal Corps, National Guard of Colorado, to report to the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Cummings while taking the course.

Connecticut

Brig. Gen. George M. Cole, the Adjutant General, has detailed Capt. Ralph L. Taylor, Connecticut Coast Artillery, of Stamford, Conn., to report to the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Capt. Ralph Taylor while taking the course.

Mississippi

Brig. Gen. Eric C. Scales, the Adjutant General, has detailed Lieut. E. M. Romberger to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Romberger while taking the course.

Nebraska

Brig. Gen. P. L. Hall, the Adjutant General, has detailed Captain Ralph E. McMillen, a licensed pilot, to report at the Curtiss Aviation School, Newport News, Va., to qualify for the "Expert" Certificate issued by the Aero Club of America. This was the response to the Aero Club of America's telegrams when sent out March 12. The cost of obtaining this license is borne by the National Aeroplane Fund.

Lieut. Edward Bagnell has been detailed to accompany Capt. McMillen to Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Bagnell while taking the course.

North Carolina

Brig. Gen. L. W Young, the Adjutant General, has detailed Lieut. D. B. Byrd, of Company F, 2nd Infantry, to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Byrd while taking the course.

Ohio

Brig. Gen. W. B. Hough, the Adjutant General, has detailed Lieut. R. H. Hoyer to report at the Curtiss Aviation School at Newport News, Va, for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Hoyer while taking the course.

Oregon

Brig. Gen. Geo. H. White the Adjutant General, has detailed Capt. Frank W. Wright to report to the Curtiss Aviation School at San Diego, California, for training in aviation. The Aero Club of America pays the personal expenses of Capt. Wright while taking the course.

Chief Mechanic Barin, an experienced aviator, has been detailed to accompany Capt. Wright to San Diego to qualify for the "Expert" Certificate issued by the Aero Club of America. This was the response to the Aero Club of America's telegram when sent out March 12. The cost of obtaining this license is borne by the National Aeroplane Fund.

Tennessee

Brig. Gen. C. B. Rogan, the Adjutant General, has detailed Lieut. Curry A. McDaniels, of the Infantry, to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. McDaniels while taking this course.

Vermont

Brig. Gen. Lee S. Tillitson, the Adjutant General, has detailed Lieut. Harold P. Sheldon, of the 1st Infantry, to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Sheldon while taking the course.

Virginia

Brig. Gen. W. W. Sales, the Adjutant General, has detailed Corporal Greenhow Johnston, of the Signal Corps, Virginia National Guard, to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of Corporal Johnston while taking the course.

Oklahoma

Brig. Gen. F. M. Canton, the Adjutant General, has detailed Sergt. Harrison Handley, of the Infantry, to report at the Curtiss Aviation School, Newport News, Va., for training in aviation The Aero Club of America pays the personal expense of Sergt. Handley while taking the course.

New Hampshire

Brig. Gen. C. W. Howard, the Adjutant General, has detailed Lieut. Arthur J. Coyle, of the 1st Infantry, to report at the Curtiss Aviation School, Newport News, Va, for training in aviation. The Aero Club of America pays the personal expenses of Lieut. Coyle while taking the course.

Kentucky

Brig. Gen. J. Tandy Ellis, the Adjutant General, has detailed B. Osborn, of the Signal Corps, to report at the Curtiss Aviation School, Newport News, Va., for training in aviation. The Aero Club of America pays the personal expenses of B. Osborn while taking the course.

The Aviation Detachment of the National Guard of New York, which has been training throughout the winter with the two Gallaudet biplanes at the Garden City Aviation Field, comprises the following gentlemen: First Lieut. Raynal C. Bolling, Commanding Officer of the Aviation Detachment; Norbert Carolin; B. J. Conlin; Edward Haggerty, James Ely Miller; R. V. Arnold; William M. Conant, Jr.; Fairman R. Dick; Donald G. Frost; R. J. Gilmore; F. S. Hoppin; Walter Tomkins Odell; H. H. Salmon, Jr.; Joseph H. Stevenson; A. B. Thaw, 2d; Geoffrey J. Dwyer; George de K. Gilder; John Flavel Hubbard; Philip J. Roosevelt; Julian R. Speyers; Phillip Durrant Smith; Alexander Mahon Craig; William Prentice Willetts.

The Naval Militia of the State of California counts three licensed aviators, as follows: A. C. Burns; Ed. Musick; Lawrence Stroud; Commander Simpson also expects to learn to fly.

Many of the officers of the Militia who are now training will be able to operate an aeroplane in the course of six

(*Continued on page* 93)

Do Not Forget to Bid For the Aero Mail Carrying Project!

The News of the Week

Rush Orders on Hydroaeroplanes for Mexico

In response to rush orders from the Navy Department six hydroaeroplanes, ordered by the government some time ago, were given builder's trials at the plant of the Burgess Company, Marblehead, Mass., last week, preparatory to shipping them to Mexico at the earliest possible moment. The machines were originally intended for Pensacola, but the lamentable shortage of aircraft with the land forces in Mexico determined the government to use these machines on the border.

W. Starling Burgess and Chief Mechanic F. L. Conway, U. S. N., made the trial flights with Aviator Walter E. Johnson of the Burgess company at Marblehead last week. The first tests showed a speed of seventy miles an hour with a complete load, a climbing rate of 300 feet a minute and a gliding angle of one in seven. For scouting purposes the new type machines are ideal.

In the new squadron of six machines the navy has departed from its usual type—the "pusher," with propeller in the rear, to the tractor, with propeller or tractor screw in front. There are two seats tandem in the steamline body, or fusilage, and the load carried is approximately 600 pounds, including fuel for four hours' continuous flight.

Massive Floating Hangar for Pensacola

A marine construction company of Pittsburgh has just launched the first floating hangar which has ever been built for the United States Navy. The hangar is of steel, 60 by 140 feet, and it draws eighteen inches of water. The hull, six feet deep, is divided into eight water-tight compartments. The steel frame is as massive as the girders of a railroad bridge. The hood, or superstructure, is so designed that it can be taken down and packed on the deck. Upon its completion the hangar will be towed to the United States Naval Aviation Station at Pensacola, by way of New Orleans.

Senator Robinson Points to Aerial Unpreparedness

Senator Robinson, of Arkansas, who is the author of the resolution authorizing a Congressional investigation of the aviation corps of the army last week, pointed to the reported loss at that time of two airmen of the First Squadron and to the injury of a third aviator as circumstances substantiating his charges of inefficiency. He did not make any charge of inefficiency against the aviator's themselves but against the whole system.

"I sincerely hope that the reported accidents are not true," said the Senator, "but if they are they show primary defects in the machines. I am advised that no mechanicians or observers accompanied these three aviators. This in itself demonstrates the unsatisfactory condition of the service as now organized.

"Its equipment is entirely inadequate. If we had an aviation service with safe machines of modern type and equipped with telephone and telegraph devices and enough mechanics and trained observers, their value in the work in Mexico would be very great."

Test of Curtiss Military Tractor at Old Point Comfort

For the benefit of a party of representatives of the Russian government a test of the Curtiss model R-2, Military Tractor was recently made at Old Point Comfort, Va., and the following results were recorded:

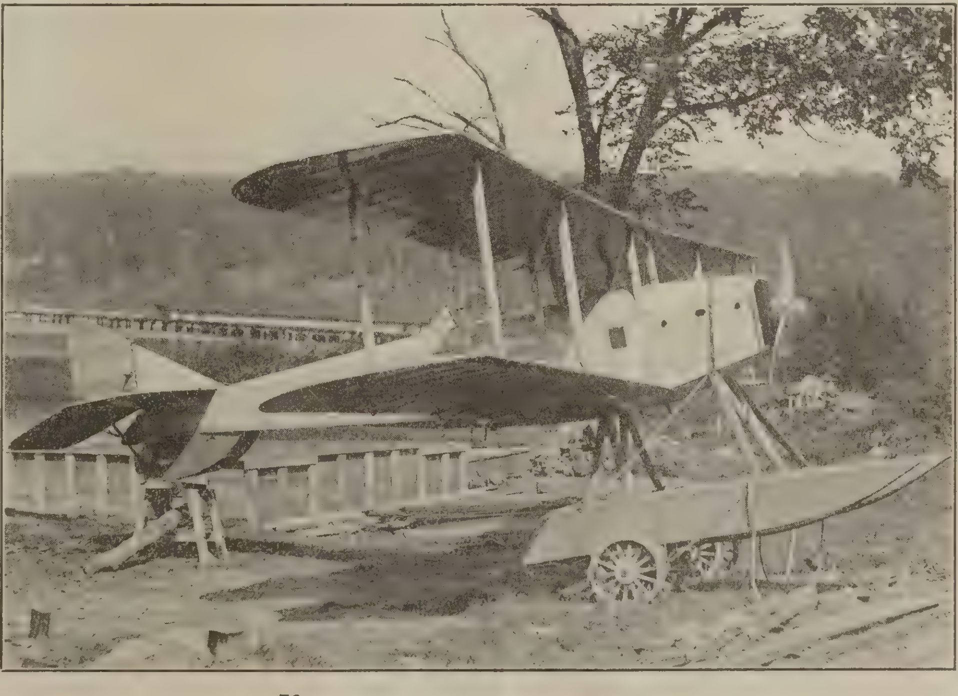
With the wind the machine attained a speed of 125 miles an hour; against the wind the speed was 75 miles an hour. The maximum speed attained was six miles per hour above the requirements.

The men who handled the machines were MacGordon, Acosta, Carlstrom, Cogswell, Vernon and Lees. Several machines were in flight at the same time.

Aviator Eden's Flights Between Palm Beach and Miami

Aviator F. C. G. Eden has opened up the aerial route between Palm Beach and Miami, Fla. Last week he flew from Palm Beach to Miami, notwithstanding a very strong southwest wind, in one hour and twenty minutes. He carried a passenger, Mr. Earl Dodge, who is purchasing a Curtiss Flying Boat for pleasure purposes. Mr. Eden will fly the boat for Mr. Dodge.

On the following day Mr. Eden flew back to Palm Beach with one of his pupils, Mr. Ivan P. Wheaton, as passenger. The seventy-two miles were made in fifty-five minutes. The wind was favorable. Mr. Eden reports that his motor never missed a shot during either of the flights.



The Thomas Seaplane, Type HS, which made a speed record during its tests at Pensacola, Florida. The speed over a five-mile course was 82 m.p.h. The machine was piloted by Frank Burnside, with Lieutenant Saufley as passenger and official timer.

Head of Army Aviation Service Hurt by a Fall

Lieut. Col. Samuel Reber, Assistant Chief of the Signal Corps of the United States Army and head of the military aviation division of the government, was seriously injured in an accident at his home in Washington, D. C., on March 23, when he fell down a flight of stairs. At the Walter Reed Army General Hospital to which he was taken after the accident the surgeons found that he had broken three ribs and had sustained internal injuries the extent of which could not be determined for some time.

Col. Reber's accident was attributed indirectly to mental strain. His son had been suffering from an attack of measles, and on account of the boy's illness Col. Reber had been worried and had lost much sleep. At his office in the War Department on the afternoon of the accident he had suffered two attacks of vertigo. Then he went home, visited the son's sick room on the third floor and was about to descend, when, it is surmised, he experienced a third attack of vertigo and fell the length of the stairs.

Col. Reber's name has been before the public to a considerable extent of late on account of the charges of mismanagement in the aviation school at San Diego, Cal., which is under his direction. Correspondence between Col. Reber and Capt. Arthur S. Cowan, who is in immediate charge of the San Diego school, was brought out during the courtmartial of Lieut. Col. Lewis E. Goodier, Judge Advocate of the Army for the Western District. The latter had been charged with encouraging members of the aviation corps to bring charges against a superior officer. As the result of what transpired at the courtmartial army officials ordered an investigation of Col. Reber's conduct and Senator Robinson brought the correspondence to the attention of the Senate and offered a resolution authorizing an investigation by a committee of that body.

Col. Reber, who is a son-in-law of Lieut. Gen. Nelson A. Miles, retired, having married Cecilia Sherman Miles in Washington in 1900, is widely known for his work in aviation, and the unfortunate accident which he has suffered not only greatly shocked, but caused an exceedingly painful impression in army circles. Colonel Reber is a native of St. Louis, was graduated from West Point in 1886, and took a special course in electricity at Johns Hopkins University in 1894. He also is a graduate in the 1905 class of the Army War College.

His first assignment after leaving West Point was as Second Lieutenant of the Fourth Cavalry, and he was transferred to the Ninth Cavalry in 1892. Two years later he was transferred to the Signal Corps. In the Spanish-American War he became a Major of volunteers, becoming Chief Signal Officer at the end of the war. Colonel Reber has seen service against hostile Indians in Arizona, in the Porto Rican campaign, and was recommended for brevet captain in the action at Guanica.

Proposes Naval and Aviation Academy in Hawaii

There has been introduced in the United States Senate, by Mr. Warren, a bill to provide for the purchase of a site and for the establishment of a naval and aviation academy in the Territory of Hawaii, and appropriating therefore $5,000,000.

Aeromarine Purchases Fifty Acres

The Aeromarine Plane & Motor Co. has purchased fifty acres of land on the water front near the mouth of the Chigarora Creek, at Keyport, N. J., for the purpose of erecting additional factory buildings.

Aeroplane Plant in Somerville, Mass.

The Johnson Aeroplane Company, of Boston, has established a working plant in Somerville, Mass. The company consists of Isaac Johnson, of Boston, formerly of Salem, N. H., and Captain Maitre, an experienced aviator.

The company has completed the construction of a biplane fitted for two passengers and an aviator, and has in process of construction what they expect will be a powerful monoplane carrying one passenger and operator. The builders expect to operate the monoplane at a speed of 100 miles an hour. They have contracts for exhibitions and passenger trips at Newport, Saratoga and other places this summer.

Tried Out New Flying Boat in Florida

Jay D. Smith, the aviator, has lately been in Tampa, Florida, where he has tried out a new type of flying boat for a Chicago firm. Thirty-five flights were made with satisfactory results.

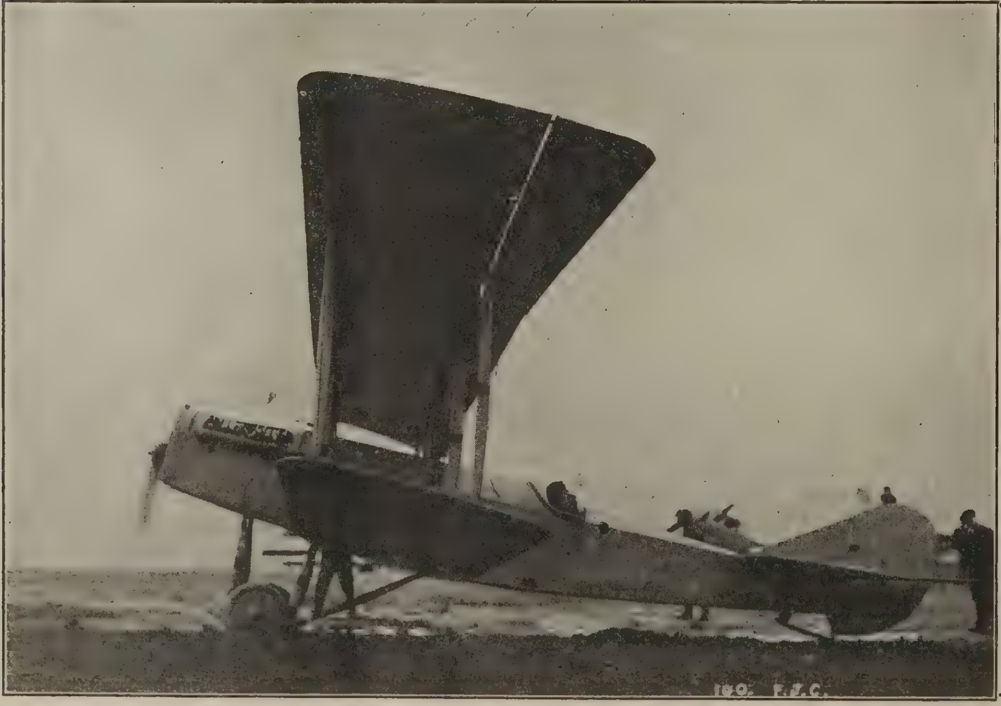
Apply for Patent on Mammoth Aircraft

A new type of aeroplane, designated as a combined aero and marine vehicle, has been invented by Adam F. Bautro, former editor of the *Polish Weekly* of Baltimore, Md., and L. E. Hoffman, former Army and Navy man and Washingtonian, and now business manager of the same publication. Application has been made for a patent and a company is to be incorporated to manufacture the plane.

The distinctive feature of the new combination boat and aeroplane is a lifting propeller directly above the machine, which enables the aeroplane to rise in a perpendicular plane on a given point to any desired height, and to remain in a stationary position in the air an indefinite length of time.

In addition to the main lifting propeller, there are two auxiliary propellers over the machine, which serve as stabilizers. At the extremities of the body of the boat are propellers which will enable the aeroplane to travel at an estimated speed of between 120 and 150 miles an hour.

Another distinctive feature is an immense hood, which will serve as a parachute to break the fall of the machine in case of engine trouble. The machine will be sixty-five feet long, with a twelve-foot beam, and will be equipped with three 225-horsepower engines and two 100-horsepower engines.



The Curtiss Type military tractor at Newport News, Va., on which the pilots the Aero Club of America are training in case of need on the Mexican border are being tutored.

Plans for Spring Work at the Burgess School

Testing of the Navy school hydroaeroplanes at the Marblehead plant of the Burgess Company continued during the month of March, despite the succession of heavy gales. Some of the flights have been made in weather that was extremely rough.

Considerable activity is on the program for the Burgess school at Marblehead, as soon as spring really arrives, and at least a dozen pupils will probably be at work by May 1. In addition to Godfrey L. Cabot and his brother Norman, Geo. R. Fearing, already mentioned in these columns, and half a dozen Harvard men, who are planning an aviation corps at that institution, three others from Boston or vicinity have enrolled. They are Ector Orr Munn and Richard Mortimer, of Boston, and Robert Knowles, of Cambridge.

All of them will take the course on the Burgess-Dunne. The two machines for the Cabots are assembled, and flights by the brothers, who have already attained a considerable degree of proficiency, await solely on the weather.

Bill to Provide Aero Corps for Coast Guard.

With the sanction of the United States Treasury Department and the approval of the Aero Club of America there is being drafted for introduction in Congress a bill to provide for a coast guard aero corps.

The new aerial corps will operate as an auxiliary of the coast guard. In time of peace it would be used to facilitate the work of saving lives and property at sea. Provision will be made in the bill for the conversion of the coast guard auxiliary into an arm of naval defence in time of war.

Wide indorsement already has been given the plan, as it would provide an important arm of defence without levying a dead charge against the naval appropriations. It is believed the aero corps as contemplated would be one of the most efficient arms of defence, because it would receive a steady and arduous training in its routine duties as a part of the coast guard.

Officials who are about to propose this extension of the coast guard work believe it will receive popular approval. The proposal is regarded as especially timely in view of the demonstration of inefficiency made by the aero corps in Mexico.

The indorsement of the Aero Club of America has been given in this letter, signed by Henry Woodhouse, governor of the club:

"My Dear Mr. Newton: I have noted with great interest that you and Commandant E. P. Bertholf of the coast guard are perfecting a plan for the organization of an aeroplane corps as an adjunct to the United States Coast Guard in saving life and property along the American coast line.

"The use of the aeroplane in this work, while new and novel, is thoroughly practical, and it would prove especially efficient in patrol work and the keeping up of communication between isolated lighthouses and the main base of supplies.

"Please advise us regarding the further details of this plan. Assuring you of our heartiest co-operation in any way possible toward the development of an efficient aerial coast patrol, I remain,"

Gov. Woodhouse in this communication suggested the use of air craft to carry supplies to isolated lighthouses. This would be a new application of the usefulness of the airship in a direction much needed, for lighthouses are cut off for months from communication, but the great usefulness of the aerial corps would be directed to expansion of the ordinary work of conserving life and property at sea.

Flying in storms to carry lines to vessels in peril off shore—and air craft are now flown in high winds—would augment the work of shore guns, which so often fail to reach a mark through wind resistance to the line they shoot.

In hunting for derelicts the greater speed of the air craft and the greater horizon appearing at the height at which it flies expand the search capacity of the coast guard cutter, slower of speed and limited to a vision from the bridge of the five-mile circle of the horizon.

Should the air craft be required to aid the coast guard cutters, to do cruiser duty during the period of the year, powerful searchlights would be part of the equipment. At night these searchlights would seek out the danger spots on the coast for any stranded vessels or other peril of the sea.

A. C. Beach Instructor for the Grinnell Co.

General Manager Hal R. Wells, of the Grinnell Aeroplane Company, of Grinnell, Ia., announces the arrival of A. C. Beech, a loop-the-lop aviator of considerable renown, to take the place of the late W. C. Robinson as aviator and instructor in aviation for the company. He is an experienced instructor, well qualified to train aviators. He will not teach pupils to loop-the-loop in the school here.

Negotiations to secure Beech were in progress before Robinson's accident, and that explains his early arrival to take up his work here. An innovation in teaching the art of flying is now to be introduced in this school. This innovation will enable the pupil to practise the feel of the controls and the means of balance on a machine which never leaves the ground. This machine will enable the pupils to practise indoors on stormy days. The practise machine is not a plane, but an indoor device. The training on this machine will be in addition to a complete course of training in actual flight in the air.

Many pupils already have enrolled for the school of aviation, and more inquiries are arriving every day.

A room at the B. F. Sturtevant Motor Co. plant at Hyde Park, showing their quantity production.

WHAT THE AERO CLUB OF AMERICA HAS STOOD FOR AND WILL NOT STAND FOR

THE Aero Club of America was organized eleven years ago. It has been the national body in aeronautics in this country, the body which, through its affiliation with the International Aeronautic Federation, which is composed of Aero Clubs of eighteen countries and makes the rules and regulations for aerial sport, has control of the sport of aeronautics in this country. There are twenty-seven other aero clubs affiliated with it. The membership of the Aero Club of America is most select, there being more leading men in this club than any other single organization in the United States.

Courtesy Chicago Tribune

It is known that many of the six hundred members of the club have contributed financially and otherwise to foster the development of aeronautics. And whereas these gentlemen became connected with aeronautics in the early days, when to be connected with it was considered an expensive hobby, they cannot be accused of having made the connection for the sake of personal gain or ulterior motive.

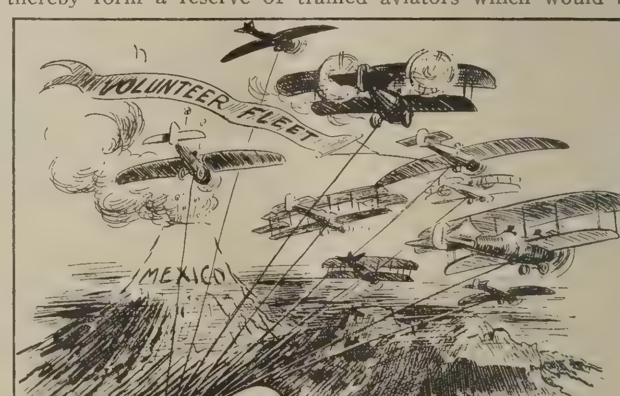
As a matter of fact, it has been the rule of the Club not to have in its Board of Governors men interested in the manufacturing and selling of aeronautical equipment. Throughout these years the members of the Board of Governors have been representative men of national reputation, whose connection with a movement has been an asset. Another rule of the Club is that no officer shall receive a salary—thereby removing even the most remote possibility of commercialism. Likewise the Club has no political affiliations. It is interested only in aeronautics.

Fostering the development of the different branches of aeronautics according to their importance, timeliness and near practicability, nothing has remained undone which should have been done. The Club has done this work in a most dignified and unselfish manner. The amount of results attained has been remarkable indeed.

A most patriotic and public-spirited institution, the Aero Club of America has always led in demonstrating its practical patriotism and sportsmanship. It has, in fact, done for aeronautics what the Government should have done, and but for this organization the aeronautical movement would have had very little encouragement.

In 1909 the United States Army acquired its first aeroplanes—two years ahead of any other nation in that respect; in 1911 the Navy acquired its first hydroaeroplane, again ahead of any other nation. Proud of the distinction which was ours through the achievements of the Wrights, who gave the world the first successful aeroplane; and of Curtiss, who gave the world the first successful hydroaeroplane and flying boat, the Club trusted Congress for a time, while this body paid little attention to aeronautics, believing the disregard to this important arm was temporary. At this time the Club awaited for action in dignified silence. Never a word of protest was there heard until the Sixty-third Congress proposed to allow practically nothing for aeronautics for the Army and Secretary Daniels made that unwise break of telling Congress that he did not want any appropriations for aeronautics for the Navy. Then the Club promptly and firmly pointed out the need and the necessity of providing an adequate air service in the Army and the Navy, and the advisability of employing aeroplanes to carry mail and in the Coast Guard and Life-Saving Service. It listened to the arguments of the peace-at-any-price element and was willing to co-operate to get the aeroplanes in use for peaceful purposes and form a reserve that would be available for use in case of need. But it would no longer assent to stand aside and see the country's need ignored.

The urging and pleading had no effect. Although the European war had demonstrated the value of the aeroplane for various purposes and the absolute necessity of having substantial aeronautical organizations in the Army, Navy and Militia Congress, led by Congressman Hay, cut the aeronautical appropriation for the Army down to $300,000. Secretary Daniels and Congressman John J. Fitzgerald used their influence to prevent Congress from allowing an appropriation large enough to develop aeronautics in the Navy. Then the Club, realizing the necessity of bringing material relief, decided to wait no longer It took steps to contribute materially toward providing aeronautical equipment, and instituted the National Aeroplane Fund for the purpose of development of Aeroplane Corps for the Militia of the States. It started a most efficient and persistent campaign of education, which it has carried out most ably ever since, and which has resulted in educating the country in Aeronautics But from the present status of Aeronautics in the Army and Navy, and the fact that even under such critical conditions as exist at present, and the further fact that we ought to have 2,000 aeroplanes available for National defense, Congress is not even planning to provide 200 it is evident that Congress has not done its duty. When it is proposed that aeroplanes be given to the Army, Navy and Militia, some political objections are made to restrict the development of this arm of the service; when the proposal is made to employ aeroplanes for carrying mail and for the Coast Guard and Life Saving Service, and thereby form a reserve of trained aviators which would be



Courtesy N. Y. Herald

available in case of need, more political objections are advanced. Even under the present most critical conditions, when it has been shown that the United States Army aeronautical corps was entirely unprepared and insufficient, and that the addition of 50 high-powered machines could do more than 10,000 soldiers in the Mexican campaign, only a pretention has been made to take a step to increase the air service or to even provide the aviators with sufficient equipment to enable them to render efficient service. The $500,000 appropriated a few days ago for aeroplanes is barely sufficient to properly equip one squadron with high-powered aeroplanes and the necessary equipment. We ought to have 20 such squadrons now.

The Aero Club of America promptly saw its duty and on the day following Villa's raid on Columbus it took steps to provide to meet the emergency and mobilized trained aviators, paying the expenses of some to take a course on high-powered machines and keep in training until called by the War Department, and paying the expenses of officers of the militia, so as to enable them to take advantage of the offer of the Curtiss Aeroplane Company, which very generously has offered to train officers of the Militia of each state.

The Club is frank in stating that it realizes Congress could do this. It has felt so ever since the present war demonstrated the dire need for substantial air fleets. But when it is stated that the Army has only eight low-powered scouting aeroplanes available to meet such an emergency, when it should have at least 200, we realize that if we waited for Congress to do its duty, we might find that Congress may do it only after thousands of American lives have been lost because they were not adequately protected.

As told elsewhere in this number, 20 trained aviators have already been mobilized and are being put through courses of training on high-powered aeroplanes. Twenty Militia officers are also being trained. One hundred thousand dollars is now being raised to buy suitable military aeroplanes, which will be turned over for the Army to the War Department—and will be turned over to the Militia of the different States after the Mexican Campaign.

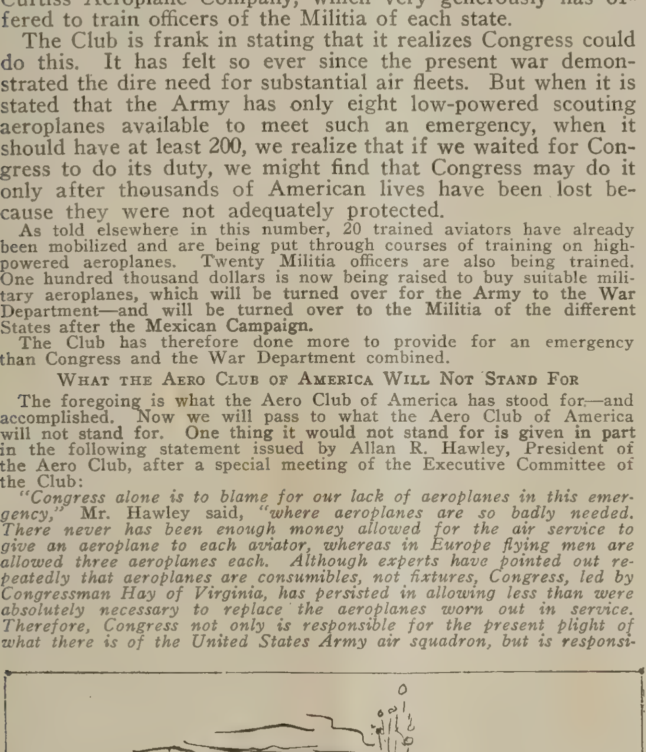
The Club has therefore done more to provide for an emergency than Congress and the War Department combined.

What the Aero Club of America Will Not Stand For

The foregoing is what the Aero Club of America has stood for—and accomplished. Now we will pass to what the Aero Club of America will not stand for. One thing it would not stand for is given in part in the following statement issued by Allan R. Hawley, President of the Aero Club, after a special meeting of the Executive Committee of the Club:

"Congress alone is to blame for our lack of aeroplanes in this emergency," Mr. Hawley said, *"where aeroplanes are so badly needed. There never has been enough money allowed for the air service to give an aeroplane to each aviator, whereas in Europe flying men are allowed three aeroplanes each. Although experts have pointed out repeatedly that aeroplanes are consumibles, not fixtures, Congress, led by Congressman Hay of Virginia, has persisted in allowing less than were absolutely necessary to replace the aeroplanes worn out in service. Therefore, Congress not only is responsible for the present plight of what there is of the United States Army air squadron, but is responsible for the death of some of the officers who lost their lives in the past during their period of training.*

"We, who are close to aeronautics, and who have seen the utter disregard of Congress to the Aeronautical needs of the Army and Navy, and who have seen officers killed practically by Act of Congress, have felt so exasperated that we have been on the point of calling on President Wilson to stop all efforts to organize an Aero Corps until sufficient funds could be procured to provide the necessary equipment.



A PERFECTLY GOOD. WAR EAGLE—WHAT THERE IS OF HIM.

Courtesy N. Y. Herald

The Lord Will Provide!

"The United States Army aviators are undoubtedly as good as any. We know them to be men of sterling character, courageous and patriotic, but they never have been given a chance. The United States forces in Mexico should have at least 200 aviators, with three aeroplanes each."

This shows clearly what the Aero Club of America will not stand for. It will not stand for trying to place the blame for present conditions anywhere else excepting where it would be placed—at the door of Congress. Officers in charge of the aero corps may have been indiscreet; they may have broken military rules in many ways; but they are not to blame for lack of equipment—Congress is to blame.

As we go to press a statement is issued by the Aero Club, pointing out aptly that 48 military aeroplanes—and not only 8, as proposed by Secretary of War Baker—should immediately be sent to the Mexican border to equip the army aviators.

There should be three aeroplanes available for every aviator connected with the Mexican expedition, and at least another well-equipped aero squadron at the border to meet any emergency. A well-equipped aviator being worth one thousand soldiers in such a campaign, there should be aeroplanes in reserve for him to use when his machine is not in order. The European countries allow three aeroplanes for each aviator. The fact that there are only eight Army aviators available makes it imperative to observe this rule, so that their invaluable time may not be wasted in waiting for repairs to be made.

Another well-equipped aero squadron is absolutely necessary at the Mexican border to meet possible emergency. This squadron will be worth more than five thousand men to protect the border, and will be invaluable if anything goes wrong and our expedition now in Mexico needs help, as it will be able to reach the advanced posts in a few hours. It is to be hoped that the aeroplanes to be acquired will be high powered, capable of speed of not less than eighty miles an hour, with fuel for four hours, food supplies, gun and bombs. The latter necessary to meet an emergency.

We regret to continually have to point out the weakness of our forces, and wish we did not have to do so. But knowing the conditions as they exist, we are duty-bound to make them known and to make every effort to supply the number of aeroplanes needed to protect the lives of our soldiers, and of the people on the Mexican border.

The letter written to Rear Admiral Benson, presented in the last number of Aerial Age, asking him to make public his reasons for attempting to prevent the establishment of substantial aeronautical equipment organization shows clearly that the Club will no longer stand aside and see naval aeronautics neglected.

Admiral Benson has replied to this letter, but unfortunately asked that it be not published. This is a misfortune, for it is evident from Admiral Benson's statement before the House Naval Committee that he knows very little about aeronautics; indeed, he does not seem to know what has taken place in Europe during the past two years.

We all know that if trouble should come to us—and no one dares to say we are immune—the Navy would need aeroplanes as badly as the Army needed them in the past month, and would find itself in no better condition in this respect than the Army found itself. Just as the worst critic of the Army never presented a more appalling arraignment of the pitiable conditions of the Army than the Army itself has presented in the last month, we submit that the most severe critic of the Navy could not present a more appalling arraignment of the pitiable condition of the Navy than the air service and the submarine service of the Navy present.

We join the hundreds of newspapers and authorities throughout the country in expressing indorsement of, and admiration for, the work of the Aero Club of America, and we are glad ot be in a position to co-operate with this organization in its efforts.

THE M. F. P. STEEL WARPLANE

ON March 29th interesting test flights were made at Toronto, Canada, by John Guy Gilpatric, in the new M. F. P. steel warplane, which has secretly been constructed by the Polson Iron Works, Ltd., Toronto, under the direction of Walter H. Phipps, designer of the new machine.

As the accompanying photographs and description show, the machine is chiefly interesting on account of the ingenious use of light steel tubing throughout the fuselage and other frames without welding, the parts being simply joined by special clips which make the construction very simple, light and strong and easy to repair.

The span of the machine is 45 feet, length 26 feet 6 inches, surface 410 square feet, and the weight a little over 1,300 pounds, which, coupled with the small surface, makes the plane extremely fast and a very rapid climber, with full military load.

It is interesting to note that the machine was completely designed in every detail before construction, and extensive tests made of all parts entering into its construction.

The most noticeable feature wherein the constructional details differ from most other machines is the use of seamless steel tubing in place of a great many of the usual wooden members. This is a practice which is rapidly finding favor abroad, where several of the most successful types are now using steel construction, and the wooden machines are using more and more steel construction on each new machine. However, a great deal of welding is used where the different members are joined and this entails much hand work.

To facilitate manufacturing, the M. F. P. aeroplanes are not only simplified to the last degree, but hand work is largely eliminated by having all parts made on jigs and assembled by bolting to special fittings. As all parts are interchangeable, it will be realized that repairs on the field are greatly facilitated. Spare parts are greatly reduced, since but few special fittings are used for all machines, each fitting being used in many places.

Other advantages of the use of steel in increasing quantities for construction are its uniformity and the fact that it does not change with seasoning or weather conditions, as wood does. The selection of a flawless piece of wood is a difficult matter, and the variation in strengths of specimens examined in testing machines shows a great lack of uniformity, which necessitates a high factor of safety. Steel, however, is far more uniform, and could be used just as safely with a considerably lower factor of safety—but to "make assurance doubly sure" a factor of safety of eight has been adhered to, based on normal flying conditions, and the elastic limit of the materials.

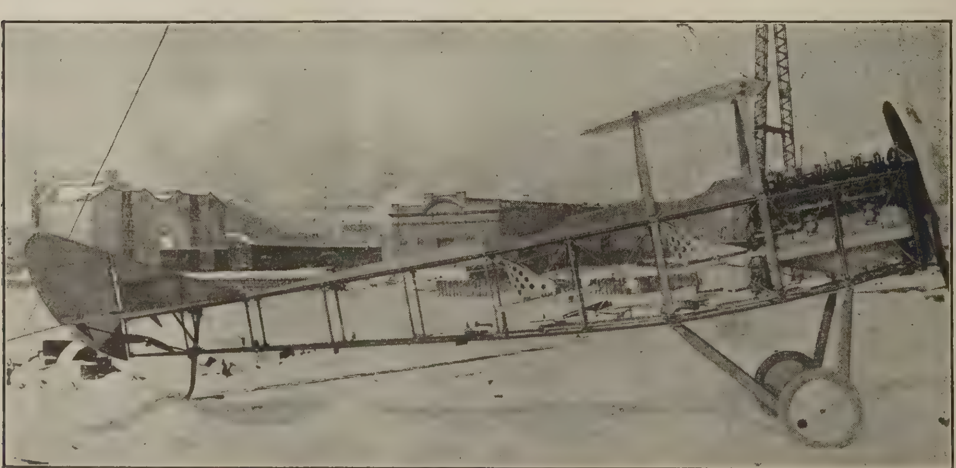
In some people's mind there is the impression that the use of steel tubing in aeroplane construction is much heavier than wood. This is an error, for steel is so much stronger than wood that a member with a much smaller sectional area can be used and yet have the same strength.

Thus, in spite of their increased strength over the ordinary machines, the M. F. P. aeroplanes are considerably lighter than a wooden machine of similar dimensions.

FUSELAGE

The fuselage is rectangular in section, 30 inches wide by 35 inches deep in front, tapering to 14 inches at the rudder. The longitudinals are of steel tubing, very light, and braced with light steel tubes, joined with a special clamp and then cross wired. As in common practice, throughout the construction of the whole machine the fuselage fittings are interchangeable. The third and fourth fuselage struts are extra large. At the top they fit into plates which carry the extension struts to the upper plane, while at the bottoms they fit into simple clamps which carry the drop forgings that carry the planes. It is in this way, *i. e.*, by careful and systematic designing throughout the whole machine, that over one-half of the many complicated fittings found on ordinary machines have been eliminated and the construction improved, simplified and standardized.

The top of the fuselage is streamlined off from in back of the pilot's seat to the tailplane by a false-work, which is readily detachable.



Detail view of MFP steel warplane fuselage.

The same streamline form, which is a distinguishing feature throughout the whole machine and a material aid in its superior efficiency, is carried out in the fuselage. On account of the narrow width of the fuselage, only 30 inches, and the position of the passenger, well forward, with the pilot well in back of the planes, both are afforded an unobstructed view both forward and downward.

MOTOR INSTALLATION

The engine, which is a 130 h.p. 6-cylinder water-cooled Hall-Scott, is mounted on two stout 4-inch laminated wood engine bearers, directly in front of the observer and separated from him by a dash, through which the starting crank protrudes. This allows the engines to be started from the seat, a great advantage for military work. The radiator, which is of special design and construction, is carried on an angle plate across the front of the fuselage, and is readily detachable, as is the whole engine also.

The gasoline is fed to the engine from a large 50-gallon tank, which is sufficient for 5 hours' flight.

PLANES

The wings are of the latest approved Eiffel section and are of one-piece construction, very light and strong. They are built up with ¾-inch grooved spruce battens nailed and glued to 3-16-inch hollowed, laminated birch and gumwood webs, assembled on two stout 2-inch tubular steel spars. This construction gives such strength that fewer uprights than usual are needed between the planes, and head resistance is reduced and efficiency is increased. The covering is Greeves Irish aeroplane linen remade to the special requirements of the British Government. It is treated with four coats of aero dope. The span of the top wing is 45 feet, giving a total supporting surface of 410 square feet.

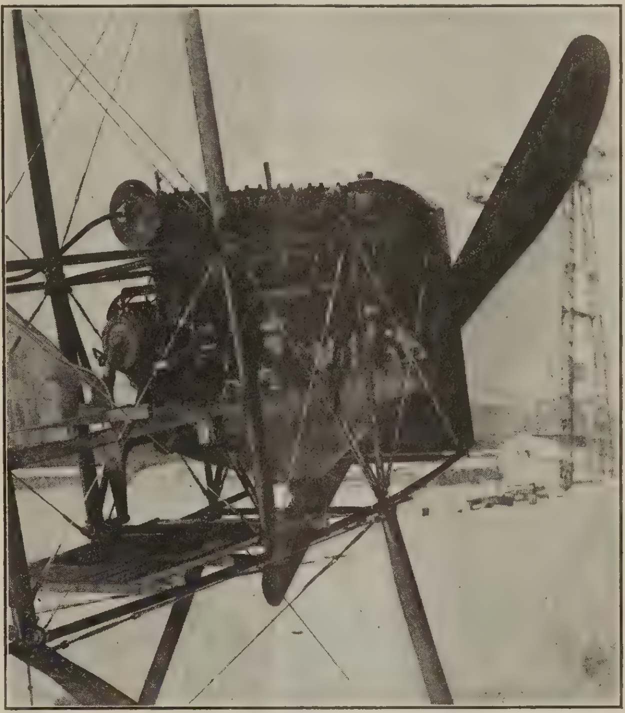
Each wing is trussed inside with four steel compression struts and strongly cross braced, a construction which aids materially in their rigidity.

The wings are braced on each side of the body with only two sets of special streamline section struts, all of the same length and interchangeable on all types of M. F. P. tractors. As in the case of the main spars and sockets, these struts have been subjected to most thorough tests for strength at the University of Toronto. At their ends they fit into special drop forged sockets, not the usual flimsy riveted straps generally used. Like the other fittings on these machines these sockets are interchangeable, and are identical on both front and back spars. They are exceptionally light and strong and have provision for double load wiring and front and back bracing.

All turnbuckles and wires have been tested to insure the high factor of safety which is an outstanding feature of all M. F. P. machines. To further enhance the safety all the joints in the wing wires and front fuselage braces are hand spliced.

LANDING CHASSIS

The landing chassis, in accordance with the other exposed parts of the machines, has been carefully designed to offer the least possible resistance. It consists simply of two stout U frames of the same streamline section as the struts, and cross braced with a steel cross member of similar section. The chassis is securely braced to the



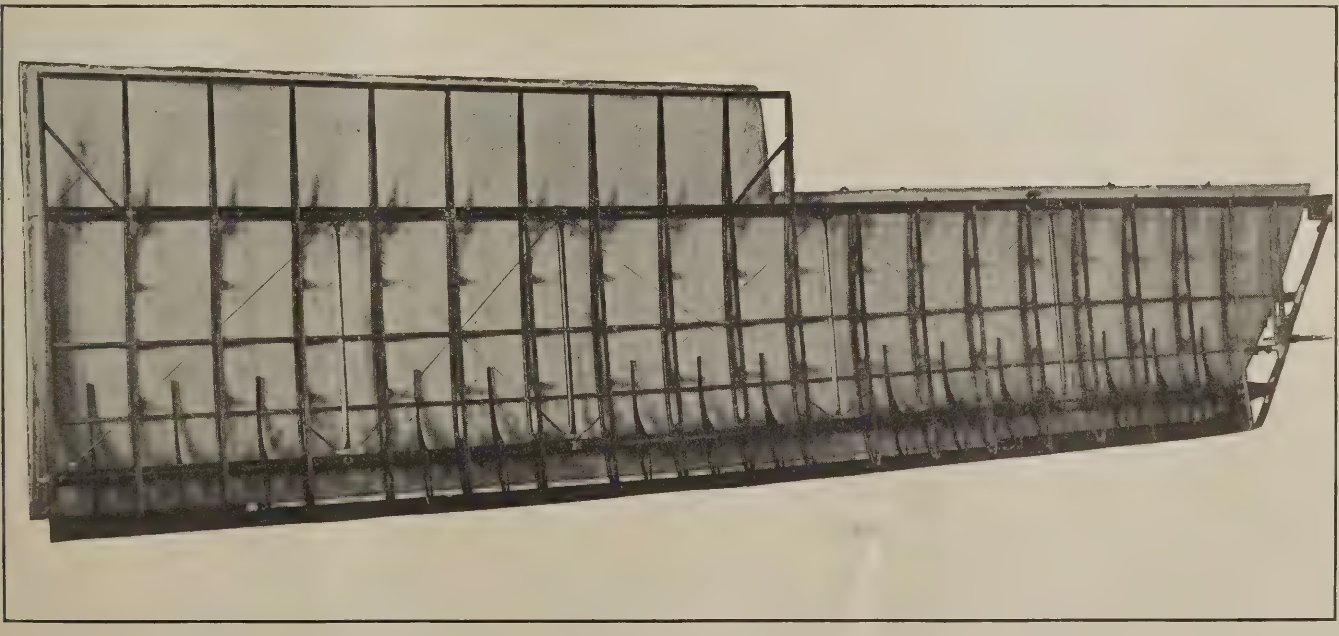
fuselage independent of the main planes, a construction which relieves the lower wings of landing stresses.

The two 26 x 4 inch disc wheels are mounted on a single 1½-inch diameter axle, which is sprung onto the chassis frames by rubber shock absorbers and guided with radius rods. The tail skid is of ash and is also sprung on with rubber shock absorbers.

CONTROLS

Controls are of the Deperdussin wheel and foot bar type, the whole control being double wired throughout. Three-thirty-second-inch steel cable is used, thereby eliminating the danger of breakage in this all-important part. Further, both the elevators and rudder are direct connected to their respective control levers, which eliminates any possibility of jamming.

With the exception of the small single seater scout all three other types of M. F. P. tractors use the same fuselage, controls and chassis. Hence, one machine can, by substituting different sized wings, be converted into (1) a 30-ft. spread fast single seater speed scout, (2) the standard two-seater type or (3) the large sea-plane.



GOVERNMENT'S AEROS NOT SUITABLE FOR MEXICO

SCARCELY had the Mexican punitive expedition swung well into Mexico than the experience of the First Aero Squadron, which accompanied it, demonstrated two vitally important things. First, the great utility of aeroplanes on this particular expedition—if the aviation section were properly equipped—and secondly, the inadequacy of the equipment. Though the machines had been subjected to no undue The number of machines had last week been reduced from eight to two—with the expedition hardly entering on its work! Secretary of War Baker announced on March 27 that two had been destroyed and four others put out of commission, leaving two aeroplanes in service.

For those who have the interest of the country at heart, for those who believe in preparedness, and even for those who believe only in the conduct of government business on business principles the situation is illuminating. Here is an American army in a difficult country seeking a bandit who knows intimately its bleak wastes, its water holes and its mountain fastnesses. The tremendous advantage his knowledge of the land gives him would be taken away from him if the American army were equipped with enough high-powered aeroplanes to meet the ordinary requirements of such an expedition.

Two members of the Aero Squadron—Lieut. Edgar S. Gorrell and Lieut. Robert H. Willis, disappeared on March 19, on the first day of their flight from Columbus, N. M., and for several days there was anxiety concerning them. Lieut. Gorrell was missing for five days and was found by troops of a motor truck train in command of Lieut. J. L. Parkinson.

He had been alone hours in the middle of a sandswept, uninhabited plateau, on the border of Lake Frederico, formerly used for a watering place for stock, but suffered only slightly from exposure to the sun. His plane was intact.

The flyer said that, shortly after the start, he lost sight of the other planes and lost his way. After flying for miles over the surrounding country in an effort to determine his whereabouts, he was forced to alight on the plateau because of a leaking fuel tank. The gasoline oozed away, and he was unable to find the leak in the darkness.

There were no signs of human habitation and no vegetation on the height, except burned clumps of grass. He made his way to a recently abandoned American camping place on the wagon trail, about six miles south. There he placed a note, telling of his whereabouts and condition, on a stick, which he drove into the ground near the trail.

Being unwilling to leave his plane unprotected, he made his way back to the lake, with the realization that, if he attempted to find a village, he probably would wander into the hills at the risk of encountering bandits or wild animals.

He said he was confident his note would be found before the three days' rations with which he was supplied gave out. When he was rescued, he had been without food for 24 hours, and said that he had about determined to attempt to find his way to succor.

Aboard the trucks which rescued him were barrels of gasoline, and, with the aid of some tools, obtained from the truckmen, Lieut. Gorrell soldered his tank and flew to Casas Grandes in an hour.

Lieut. Thomas S. Bowen was last week brought back to Columbus, N. M., to recover from the injuries he received in a fall as he was making a landing with his aeroplane. The aviators, he said, had proved their value as scouts with the Army by at times flying 65 miles ahead of the advancing column and being able in the clear atmosphere to see the whole country as on a map. But the machines, according to the aviator, are not powerful enough for effective work in the climate.

Lying on his cot in the long pine board building hastily erected there to provide for the men at the front, the Lieutenant talked of his own and the other seven aviators' experiences, giving the first direct account that had been received there of the trip of the American aviators. He talked with difficulty, his face being swathed in bandages, for his nose was broken on March 20 when his aeroplane fell at Casas Grandes, and it had just been set in place by the surgeons at Columbus, under Colonel E. B. Frick.

Until Lieutenant Bowen was brought back nothing was known at Columbus of the accident that caused Lieutenant Robert H. Willis, another flier, to reach Casas Grandes two days late.

"Lieutenant Willis flew thirty-six miles south of brigade headquarters by accident," Lieutenant Bowen said, insisting on telling about his companion before himself. "It was growing dark, and he descended. In doing so he struck a slight rise in the land and broke part of the mechanism. He realized that he had gone beyond his destination, and was unable to fly back to safety. So he began the long walk back under the cover of darkness. When it became daylight he hid. He had with him only a small quantity of rations and a map.

"On the second night he started ahead in the dark again. He told us afterward that he began to doubt whether he had the direction. Some time about midnight he saw something burning ahead, and on reaching it found it was a railroad tie on fire. He crept up and began examining his map, when suddenly there was a yell a short distance down the track, and three armed Mexicans rushed toward him. Lieutenant Willis fled into the underbrush and hid. After a long search the men gave him up. He reached camp at 2 o'clock in the morning."

The aeroplane was rescued by a motor truck.

Regarding his own accident, Lieutenant Bowen said that he flew without mishap to Ascension, where the aviators stopped over night. Then he went on to a point within a few miles of the Casas Grandes headquarters. Here his gasoline gave out and he had to go to camp for more. When he resumed his flight late in the afternoon, the air was "puffy," he said. He reached the field at headquarters and was about to land when his machine, about sixty-five feet in the air, was caught by a sudden puff of wind and "side slipped."

"I got out of this all right, head down, and was just beginning to bring the machine to a level when I struck ground. If I had been twenty-five feet higher I would have escaped. I was unconscious half an hour."

When asked if the United States aeroplanes were effective in the rarefied air of the lofty district over which they had to fly, he said that while flying low they had good results.

The aeroplanes at the front are now rendering invaluable scout service, he said, flying as much as sixty-five miles ahead of the advance column. But the ninety horsepower machines, he added, had not sufficient driving force for flying over high country. The trip to Casas Grandes was made at an average altitude of 5,500 feet.

"It is excellent country for aviation work," the Lieutenant went on. "It was very easy to recognize the course, and on the prairie there are numerous good places to land. It will be different if they get to the Sierra Madre. I could see the whole country lying beneath me like the map I carried. First I recognized Boca Grande. At the same time I could see Ascension and Guzman Lake. Then I picked up the Juarez Railroad and the Casas Grandes River, along which the bright green trees made a wonderful landscape.

"I don't know whether anybody shot at us. It is impossible to hear with your engine hammering like a rapid-fire gun. We can see flashes when the artillery is at work, but we can't hear even the seven-inch guns."

After a brief stay at Columbus Lieutenant Bowen will go to San Antonio for a rest.

The members of the First Aero Squadron last week disproved the report that Villa was surrounded. Flying over the territory south of the American army headquarters at Colonia Dublan, Chihuahua, the supposed rendezvous of Villa, they reported that stragglers from the bandit's forces were on March 25 taking to the hills on foot. Villa was believed to be 100 miles south of the wooded region where the cavalry hunt for him was then in progress.

Besides the scouting duty devolving on it, the Aero Corps has already been pressed into service for courier duty. Lieut. Herbett A. Dargue flew from Gen. Pershing's headquarters at Colonia Dubland on March 25 to Columbus, N. M., carrying army orders and news dispatches. He had made the 165 miles from Casas Grandes in two hours and twenty-five minutes and had braved death in coming through. In a mountain pass he had dropped 4,000 feet on account of an eddy formed by conflicting winds and he barely escaped death by righting his machine fifty feet from the earth.

Lieut. Dargue says that three shots have been fired at aviators in Mexico and one at a motor truck. He also reported that after Lieut. Bowen fell at Casas Grandes a week ago his machine was burned, the motor being the only part that was worth saving.

Shortly after Lieut. Dargue's arrival, a machine gun, mounted on a truck, and convoyed by a double guard, went over the border into Mexico. A train consisting of twenty trucks carrying rations and gasoline also crossed the line in response to Gen. Pershing's call.

One of the first troubles encountered by the aviators was due to the rarified air in the Sierra Madres mountain range, which threw the engines out of tune.

The further Chihuahua is penetrated and the higher the

(*Continued on page* 95)

FOREIGN NEWS

By JAMES E. CLARK

FRANCE

Georges Guynemer, the young aviator who holds the French record for shooting down German aeroplanes, having a total of eight victories, is recovering in a hospital from the bullet wounds he received in the last encounter, over Verdun.

"The Fokkers are the most dangerous German machines," says the aviator, "particularly the single seaters.

"The chief nervous strain of flying is in seeking the enemy machine. The noise of your motor drowns the enemy's hum, and he appears almost instantly from invisibility.

"My success has been due to watchful waiting for an opening to score against my opponent. I once chased a German for forty-five minutes before getting an opening to open fire.

"I haven't any particular desire to bring down a Zeppelin, as there is no excitement in that combat. I prefer aeroplanes. German aviators of the better class are courteous sportsmen, but their infantrymen have been known to shoot down French airmen forced to descend in the German lines.

"I enjoy flying always alone, and always pull the mask down off my eyes over my nose when fighting. I am anxious for duty again."

The young aviator's military medal is also stained with his own blood. He won't remove the clot because of a superstition.

"I shoot slowly with the machine gun," he said. "No use firing at top speed; you can only carry a limited supply of ammunition and don't dare run short of cartridges. I fire the machine gun with one hand, operating the plane with the other and with my feet."

To get into the aviation service of France the candidate must have physical and moral qualities of an unusual order. It is not sufficient that a man should be an aviator, able to control a machine in the air; he must also be able to control himself in a marked degree. To ascertain whether or not he is a man actually able to withstand nervous shocks, or whether he is a man who is merely able to conceal his emotions, ingenious methods have been devised for his examination. To begin, the candidate has to perform satisfactorily a rhythmic and continuous movement with both hands, the regularity and power of which is registered on a paper drum. He is next seated in front of a clock, the needle of which moves around the face once every second. As soon as he sees the hand begin to move he has to stop it by pressing a button, the record showing rapidity of synchronism between brain and hand.

Last of all he holds a recording instrument while others are attached to his chest and pulse to register heart and lung movements. He is then suddenly subjected to some violent sensation, such as the blinding flare of a magnesium flashlight, a loud report or a splash of ice cold water. Any very strong willed man may be able to control his muscles so as to give no outward sign of the perturbations caused in his mind, but the machines record the slightest tremble, quickened breath or faster heartbeat. The model pilot should remain not only morally but physically imperturbable and in spite of fatigue or danger his organism should always be ready to respond to the almost automatic reflexes which he acquires in his training as well as to the commands of his will.

The perfection aimed at in order to obtain men ready for any emergency is, according to one authority, "an emotional passivity, combined with the most rapid motive reaction." The standard established is roughly that the muscles of the arms should be able to continue the rhythmic effort without fatigue equivalent to a weight of about 350 pounds. The time that should elapse between the starting of the little hand on the clock face and the pressing of the button which stops it should vary between 15-100 and 23-100 of a second. In the case of the test for quick shock any small signs of quickened pulse or other symptoms of agitation should never last and should be at their maximum at the moment of the disturbance.

In the battle of airmen as the result of a raid by the Allies on Metz and Mulhouse there was witnessed one of the most spectacular aerial encounters of the war. A total of seven machines of both sides were brought down, and two of the aviators continued their duel until they fell riddled with bullets.

The official report of the French War Office says of this encounter:

"Five of our double motor aeroplanes bombarded the Sablons station at Metz, and the ammunition depots near Chateau Saline and the aerodrome at Dieuze. Thirty shells of large calibre were dropped during the course of this expedition, of which twenty fell on the station at Metz.

"One of our groups of bombarding aeroplanes, composed of twenty-three machines, dropped seventy-two shells on the aviation camp at Habsheim and the freight station at Mulhouse. Enemy aeroplanes pursuing our airmen engaged them in an aerial battle, during which one French machine and one German machine were forced to descend by their reciprocal machine gun fire. Two other German aeroplanes fell in flames and three of ours were seriously damaged and obliged to descend in enemy territory."

The German report of this raid is as follows: "In an enemy aerial attack on Metz three civilians were wounded.

"Of a French aerial squadron which attacked Muelhausen and Habsheim four aeroplanes were shot down in an aerial fight near Muelhausen. The occupants of the machines were dead. At Muelhausen seven civilians were killed and thirteen wounded. At Habsheim one soldier was killed."

GREAT BRITAIN

The British lost three seaplanes in an attack made by an aerial squadron on the German airship sheds on Schleswig-Holstein on March 25. They were brought down by anti-aircraft guns on and about the Island of Sylt. Four English officers and one non-commissioned officer who were in the machines were made prisoners. The official statement says:

"An attack by British seaplanes was delivered upon German airship sheds in Schleswig-Holstein, eastward of the Island of Sylt. The seaplanes were convoyed to their rendezvous, close to the German coast, by an escorting force of light cruisers and destroyers, under Commodore Tyrwhitt.

"Three of the seaplanes which took part in the attack are missing. The destroyer Medusa was in collision with the destroyer Laverock, and it is feared that in the stormy weather which prevailed last night the Medusa may have been lost, but no misgivings are felt as to the safety of the crew. Two German armed patrol vessels were sunk by our destroyers."

The German account of the same event says that the attacking squadron was composed of five aeroplanes, one of them a great armored craft, and that they took flight from the deck of one of the British ships. Among the three aeroplanes brought down was one of the battle planes. The Island of Sylt, behind which lie the Zeppelin hangars, has in recent years been developed on a large scale as a naval and military station, with the object of completing the outer line of German cost defenses which run through Borkum and Heligoland. The number of Zeppelin sheds on the Schleswig-Holstein coast probably reaches eight or ten. There may be twenty or twenty-five of the large type of naval Zeppelins in existence, though many have been lost. Most of those housed on the German North Sea coast from Emden to the Danish frontier are protected by very powerful anti-aircraft artillery, including 4.1-inch guns which fire 35-pound high explosive shells to a height of 26,000 feet—or so the Germans claim—and which can discharge ten rounds a minute.

In his initial speech in the House of Commons, sweeping changes were demanded in Great Britain's air defense methods by Noel Pemberton-Billing, who was recently elected to a seat in Parliament on an "air defense" platform. He arraigned the British air service as inefficient, and he declared that as the result of a blundering policy many officers in the service had been "murdered" rather than killed. He further declared that the Earl of Derby was not qualified for appointment as chairman of the committee on control of the air defense because he did not know his subject.

Nothing further developed in the Commons in connection with the charge, but in the House of Lords the Duke of Devonshire, replying to a question by Baron Beresford on the same subject, said:

"No authentic record exists of any officer losing his life through a faulty machine, although two officers were killed while making important experiments."

Baron Beresford thereupon apologized for his statement, saying that his information came from what he considered a reliable source.

Unofficially it is announced in London that in the raid of March 19 on England by four German seaplanes two of the invaders were brought down. One was pursued thirty miles out to sea and dropped into the ocean. Now it transpires that another met the same fate. A British airman who was crossing the Channel in a new aeroplane saw the raid in progress, and joining in the chase of the Germans succeeded in bringing down one of their machines.

The official German account of the raid said all the aeroplanes returned safely.

GERMANY

Lieut. Boelke, of the German aviation service, has a record of having defeated and brought down thirteen enemy aviators during the war. Lieut. Parschau has brought down four. Each of these men added to his list of victories one day last week, when in aerial engagements north of Verdun three Allied aeroplanes were brought down. Two of these fell behind the German lines, and the third fell in flames behind the lines of the Allies.

The hundredth Zeppelin has just been completed. More than half of that number has been built at the great aircraft base in Friedrichshafen, and the people of that town are advocating that the completion of the hundredth airship be observed by a great air raid on Paris and London. With this announcement comes the news that Count Zeppelin, now in his seventy-eighth year and in failing health, has decided to accept the advice of his physicians and retire from active participation in the construction of the craft bearing his name. For the last eight months his health is said to have been unsatisfactory, due to his age and the strain incident to the building of the air fleet.

Smoke bombs are the latest equipment of the German aviators with the army. Several have been dropped on French batteries. The bombs are not in themselves deadly, but when they strike they emit an immense volume of intense black smoke, which persists for a long time, serving as a guide to the German artillerymen who are seeking to locate the batteries of the French.

GREECE

An attempt at another Zeppelin raid over Salonika was made a few days ago. The Zeppelin did not reach the city, however, being kept beyond the French lines.

A French biplane, whose observer was a Greek volunteer, Albert Misvachi, a native of Salonika, was shot down at a height of 8,000 feet, falling into Lake Doiran.

HOLLAND

Dispatches reaching Amsterdam tell of the recent raid by 65 Allied aeroplanes on the German base at Zeebrugge. The bombardment lasted several hours, and after the raid was over a great fire was observed at that point.

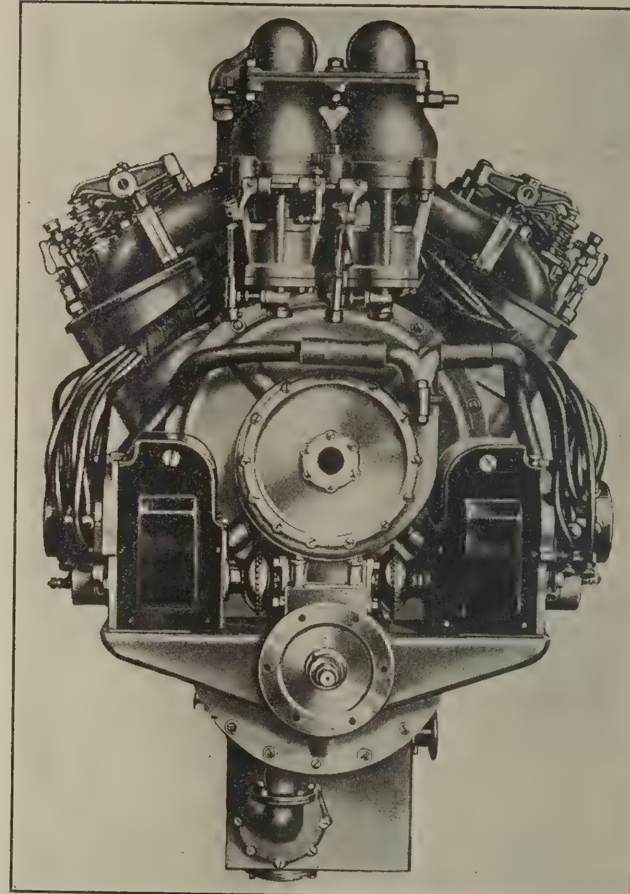
A German aeroplane from Coblenz has landed at Herpt, in Holland, according to the Telegraaf. The machine and its occupants were interned.

RUSSIA

A massive battle aeroplane, developed in Russia and used principally as a "Zeppelin hound," was described by Captain Eugene Vetchoren, a Russian aviator, who arrived in New York from Liverpool a few days ago. The Russian dreadnought of the air carries sixteen men and three tons of ammunition and can cruise for six hours without descending. It is armed with three guns.

VAN BLERCK "TWIN SIX" AERONAUTICAL MOTOR, MODEL F-12

AFTER many months of experimenting, building and re-building, testing and re-testing. After subjecting the motor to every conceivable kind of abuse, after putting it through endurance runs and having found the engine stand up with a virile strength, the Van Blerck Motor Company has placed on the market their twelve-cylinder "V" type aeroplane motor that they guarantee to develop 185 h.p. and 1,400 r.p.m. So convinced are the manufacturers that this engine meets the requirements of the industry and that it will stand up against the work to which it will be subjected, that material for five hundred (500) complete motors has been contracted for and much of it is already delivered, consequently, they are in a position to start turning out engines in quantity immediately, especially in view of the fact that they recently moved into a very much enlarged factory that enables them to manufacture motors of this type in a highly efficient manner.



General

The model F-12 has twelve cylinders arranged in the usual 60° V, and staggered to provide for independent connecting rod bearings on crank pins. Cylinder bore is 4½" and stroke 5½", giving a piston displacement of 1049.7 cubic inches. The rated power of 185 h.p. is delivered at a speed of 1,400 r.p.m. The motor weighs 600 pounds without propeller, radiator, self-starter, lubricating oil, water and fuel.

Detail Specifications

Crank Case. Crank case is made of high grade steel stampings. The motor supporting arms are steel tubes passing through a tubular section of the drop-forged web and nut-locked in place. These tubes, three in all, extend a sufficient distance outside of crank case to permit adequate means for firmly mounting motor on supporting members of the fuselage.

Crankshaft and Main Bearings. Crankshaft is of chrome nickel steel, drop forged and double heat-treated, machined all over and carefully balanced. Drive end is taper turned to receive propeller flange. Crankshaft is drilled hollow for the forced feed lubrication system and for lightness. All bearings are of high-grade babbitt and they are easily replaced. The bearings in the crank case are of the bronze shell babbitt-lined type and they are interchangeable.

Camshaft. The camshaft is of high-grade machine steel, drop forged, with cams integral, and drilled hollow for the forced feed lubrication system and for lightness.

Gears. All gears are of nickel steel, cut from solid drop forgings and heat-treated.

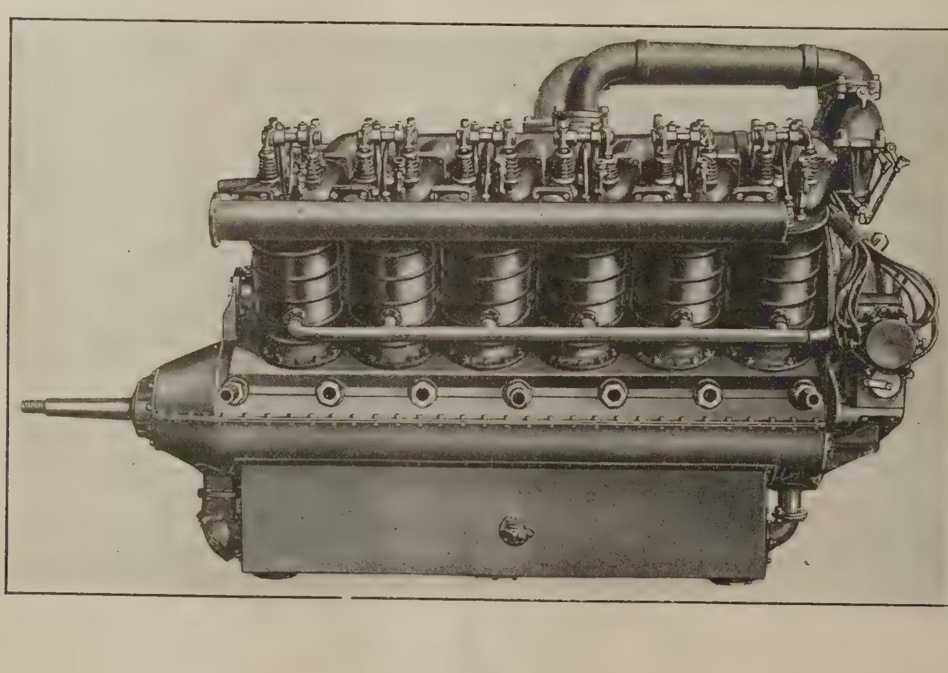
Cylinders. Cylinders are forged from special high-grade steel, and with cylinder head integral. They are carefully heat-treated and accurately ground to size. Cylinders are bolted to crank case with chrome nickel studs passing through flange at lower end and securely nut-locked.

Valves. Both inlet and exhaust valves are of the mushroom type and are made of tungsten steel. Valves and valve cages are easily removable. Operation of the valves is by means of roller push rods, ball and socket tappets and drop-forged rocker arms. Helical springs are used for both intake and exhaust valves.

Water Jackets. Water jackets are of spun copper. Jacketing capacity is ample to insure efficient cooling at all times.

Pistons and Rings. Pistons are of cast iron, turned and ground to size, and carefully balanced. Each piston is fitted with three concentric rings of semi-steel.

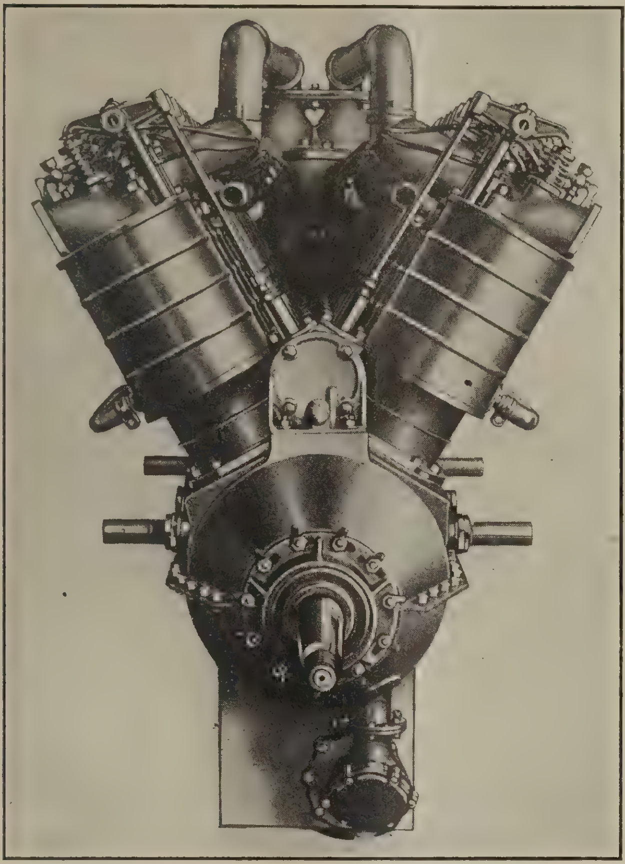
Connecting Rods. Connecting rods are of chrome nickel



Side view of the Van Blerck "Twelve."

steel tubular in section, drop forged, heat treated and carefully balanced. Crank pin end is fitted with two chrome nickel steel retaining bolts and nuts to secure the bearing cap. Piston end is fitted with bronze bushing, which oscillates on wrist pin held stationary in piston.

Thrust Bearings Thrust and radial bearings are of the ball type with unit housing.



Oil Reservoir. Oil reservoir is of sheet steel and is completely separated from crank case.

Oiling System. Lubrication is effected by means of a pressure system as follows:

Oil from the reservoir is forced through a manifold to the center main bearings by two duplex pumps submerged in the oil, one at each end of the crank case. Holes drilled in the crankshaft register with holes in bearings, and the hollow crankshaft acting as a manifold distributes the oil to all main and crank case bearings. From the crankshaft the oil is led to the camshaft, which has holes in it same as crankshaft, distributing the oil to the camshaft bearings and cams. A small hole in the back of each cam acts to spray oil for lubrication of all tappets and rollers. Oil draining from the camshaft lubricates the timing gears. Oil from all bearings drains to two pumps, one at each end of the crank case, and it is forced back to the reservoir by action of the duplex pumps. The oil is then strained before being again circulated through the system. Under no circumstances will oil flood the cylinders. This system is not affected in the least by any angle of flying and the machine can completely capsize without flooding the motor. A pressure gauge mounted in front of aviator indicates at all times the pressure in the system.

Water Circulating System. Water circulation is provided by a duplex centrifugal pump having two outlets, each supplying one set of cylinders. Pump capacity is ample to provide sufficient cooling water under all conditions.

Intake Manifolds. Intake manifolds are of aluminum, connected to carburetor by water-jacketed intake pipes.

Carburetor. Carburetor is of the Duplex type, designed especially for aeronautical motors.

Magneto. Two 12-cylinder, single-spark magnetos are used, providing two complete ignition systems.

Spark Plugs. Each cylinder is provided with two spark plugs of an approved make.

Having the foresight to place orders far in excess of one million dollars' worth of material last fall, this material is now on hand, enabling them to build up motors very rapidly and efficiently. Their standardization of one type and size of motor also materially assists them in turning out large numbers of completed motors, as each man works at one particular job all the time and obtains an efficiency impossible under the old method of building twenty or thirty different models and sizes. The entire factory is working a day and a night shift and as many men as possible are employed. A high rate of wage prevails throughout the plant, and only the very highest grade of mechanics are employed, which leads to more and better work and a contented organization. All in all, the Van Blerck Motor Company finds itself in a very enviable position, and there is not a man in the trade to-day that doesn't feel glad that at last "Joe" Van Blerck is getting what he has so long striven to get—a successful motor and a satisfactory income.

The new Van Blerck assembly building as it looked on Sunday, March 12, after it had been occupied for less than thirty days. How in the world the Van Blerck people were able to get their engines out as they did without this building is hard to understand, as this new addition looks crowded to the neck now. Most of the finished and partially finished motors seen in this photograph are the eight-cylinder 6" x 6", 250 h.p. Van Blerck, forty-seven of which are on order for domestic use and thirty-four more for the Russian Government.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

DETROIT AERO RESEARCH AND MODEL CLUB
c/o William P. Dean, 1717 Concord St., Detroit, Mich.

BUFFALO MODEL AERO CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

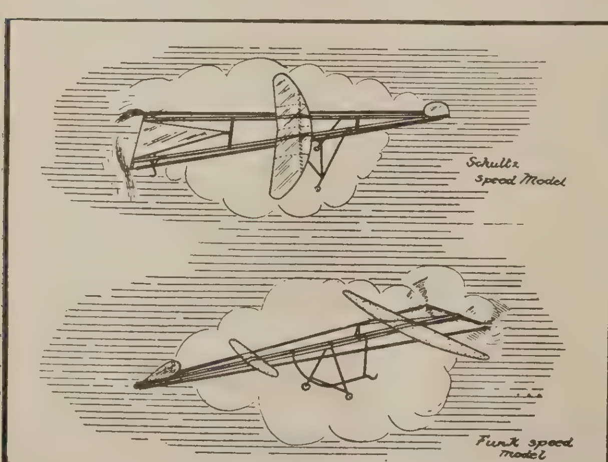
Illinois Model Aero Club

By Arthur E. Nealy

Friday evening, the Social Activities Committee held the most successful of all scientific lectures that have preceded. Over fifty were present, a few from the Aero Club of Illinois, and three or four aviators and constructors whom we used to see about the old Cicero flying field. Mr. Lindsay Hittle delivered a very well prepared lecture on "Staggered and Unstaggered Biplanes, and Their Relation to Climb and Speed." He brought with him large drawings which helped greatly in getting his message to the newer members of the club. Mr. R. Hoffmann came next, with a lecture that was even better than the excellent ones preceding that this gentleman has favored us with. Mr. Hoffman spoke on "The R. A. F. 6 in Different Biplane Arrangements," based on research work heretofore unpublished in the United States. The third speaker was Mr. Horrace B. Wild, licensed aviator, who has lately returned from a trip to the various American aviation factories. His subject was "American Military Aeroplanes," and the recital of his travels through the Curtiss and Sturtevant plants were especially interesting. Mr. Wild, in his talk, mentioned the fact that members of the model club would do well to form a class in aviation, with Mr. Hoffmann as instructor. He spoke at length on this proposition towards the end of the lecture and upon taking his departure received the signs of great enthusiasm developed. Twelve members were signed up by a member of the club to enter the class. The last speaker was the admirable George Z. Weaver, who has but just returned from the Sloan Co. Mr. Weaver spoke mostly regarding the activities of the Aero Science Club of New York, mentioning that we would do well to follow the latter club's example and appeal not only to model enthusiasts, but to real would-be aviators also. The meeting was adjourned at 11:30.

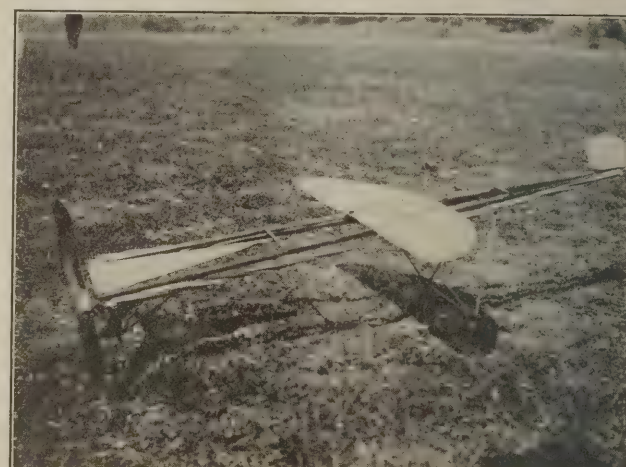
The Funk Speed Model

A speed contest is perhaps one of the most interesting kind of model contests that can be held. To the model flyer that has never participated in a speed contest it would appear that by overpowering the model the necessary speed can be obtained. But this is not so; for every part of the model must be carefully considered, so as to insure proper balance, and this is not an easy task. The model must fly as straight as possible for a distance of 528 feet—or whatever the distance may be—and to win must outspeed all other models. The model shown in the accompanying drawing was constructed by Mr. R. Funk, of the Aero Science. At a past contest this model flew over a course of 528 feet or 1/10 of a mile in 14 2/5 seconds, thus winning the contest, demonstrating its superiority over all other models entered in that contest.



The fuselage or main beam of this model consists of an I beam of spruce measuring ¼″ by ⅜″ at the center, and tapering towards the front and rear ends. In order to strengthen the same it is covered with fibre paper and treated with Ambroid varnish. Extending upwardly from about the center of this stick is an upright of wire, looped at its upper end and passing from the front of the stick, through the loop, and to the rear of the stick, is a single strand of very fine steel wire. At the rear and fitted into a slot in the stick, is the propeller spar measuring 7¼″ in length, and ¼″ wide by ¼″ in thickness.

The main planes are entirely constructed of 1/32″ flat steel wire, the main plane measuring 19″ in span and 2″ in chord at the center. The elevator measures 6″ in span and has a chord of 1¾″ at the center. Both planes are covered with China silk and treated with Ambroid. A small fin constructed of steel wire and covered with silk, treated with Ambroid, is secured in the front of the model, as shown.



The chassis is constructed of 1/32″ steel wire. It consists of a central skid, the front upper end of which is bent into a square to fit the main stick. It extends downwardly and then rearwardly, where it is bent slightly to form a support, and act as a skid for the rear portion of the model. Extending upward near the rear of this skid, the upper end of which is looped about the main stick, is a wire brace. The portion of the chassis to which the wheels are attached is of a triangular form, the upper end of which forms a square, through which the main stick passes. The entire chassis is removed by simply withdrawing the main stick from the three square portions of the center skid, wheel portion and brace.

The propellers are 7″ in diameter and of rather low pitch. They are constructed of thin birch steamed to shape, each half of the blade being made separately, and then the two halves constituting the entire propeller being joined at the center, thus forming a thickened portion, through which a perforation can be drilled for the reception of the propeller shaft.

Each propeller is driven by 8 strands of ⅛″ flat rubber. The entire model weighs slightly over 2 ounces.

The Schultz model, which came second in this contest, having flown the distance in 16 seconds, is another interesting type of speed marvel.

(*Continued on page* 95)

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Limerick

By Alice Hunt Bartlett

Of course, it is past all denying
There's nothing that's better than flying.
Beyond all compare
Is "taking the air."
It's what you call—well—satisfying.

Letters of a Mechanician

By Arthur E. Nealy

"Slim—

The Boss an' me got the raw end of a awful deal here yesterday, Slim. We lost a big contrack to lift up the men of the busines mens club of this city into the air fer 5 minite flyghts at 25 bones per each. When our trucks pulled into the flying field we found that some poor excuse fer a aviater wuz their a-head of us after us shiping the whole macheen an' engine here fur nothing. Wus us mad? Ast me, Slim!

Ut ferst I thaught I'd better go over an' punch the "Poor Excuses" face, so I walks up to him.

"Smoke?" I says. He wus pretty huskie.

"'Nope,'" says he, "'too busy. Going to clean up a lot of cash here,'" says he. "'Passengers at 25 per.'"

He wus jus kidding me, cause he new I an' the boss wus the aviaters he had beaten to it. That kiddin natcherly made me mad.

"Some outfit y' got here," I nods cuntemptusly, "especk to fly with this errangement?"

"'Haw!'" says he.

"I'll be here to watch you make straightaways," I says, an' leaves him.

He had played us a dirty trick. We had to get even an' if I do say it myself, Slim, I got a great head for enything, getting even included.

Well Slim I hot-foots it back to the main part of this here villidge, er town er city (wichever they calls it) and goes into a conference with every undertaker theys got. Y' see I'd told the boss about my skeme and he was es mad as I an' wus going to finance th' money end of this act of mine. Well, then I rents a full dress suite, a black one, wich is whut they wears to funerals I guess, an' then gets me a a pair of white gloves.

Erbout 2 pm, when the flying grounds wus bustin' full of people, I, setting in the front seat of the first automobil, leads five big, black ahmbulences thru the crowds an' across the field. Jus erbout that time their home-made band wus aplayin' "Tramph-Tramph the Boys is Marchin" an' I gets up an' waves back to the other undertakers to open their exausts as that would make a good accompanyment to the "Tramph-Tramph." Everybody looks at us an' our solemn percession an' commences to do some tall cogitatin'. We had 'em on the run.

That fool band was playin' right into our hands. The next pice on the program wus "O where is my wanderin' boy t'night," an' wile they wus playin' it I stops my ahmbulence in front of the "Poor Excuses" macheen, direcks the other ahmbulences to different part of the field where the "Poor Excuses" an' business men might fall in a flyght and we all commences layin out our bandages, meat saws, arnica, etc.

That wus all, all that wus necessery. By the time they had finished "O Where is my Wanderin' Boy T'night" those 25 per busines men were hiking back to town for beer an' smelling salts. I ast you Slim, do I urn my ten per?"

"Buck."

The Optimist

Doc (to Aeronaut with broken leg)—How are you this morning?

Patient—Oh, can't kick.—*Pitt Panther.*

Two Irishmen were employed clearing the aviation field, and while passing them, the foreman overheard the following conversation:

"Pat, and did yez ever drink any of that Dago Beer?"

"Shure, and what is Dago Beer?"

"Begorra, yer ignorance surprises me! Didn't yez ever hear of Guiness Stout?

"What's the matter, Jones? You look as though you had been run over by a jitney."

"It's worse than that—I did the running over."

"Kill a man?"

"Worse than that."

"Smash your aeroplane?"

"Worse that that—when I ran into the fence I punctured my tank and lost two gallons of gasoline."

Aviatrix—Do you keep a diary?

Aviator—No; it wouldn't be fair to the girl I marry.

Mechanic—Say, but I gotta swell job this summer. Easy work.

Friend—I bite, what is it?

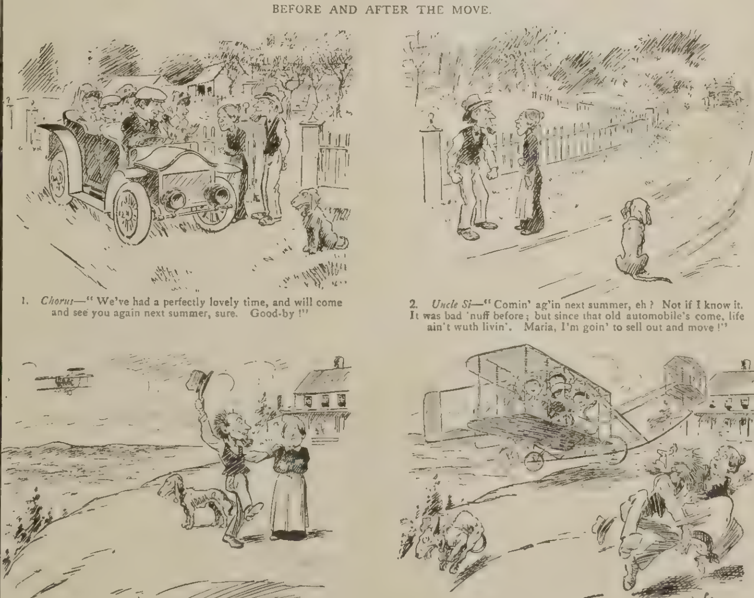
Mechanic—Workin' in a bolt factory doin' "nuttin'."

The Hydroaeroplanist was suffering from rheumatism.

"Every bone in my body aches," he complained.

"Yought to be glad you are not a herring," said his friend.

BEFORE AND AFTER THE MOVE.

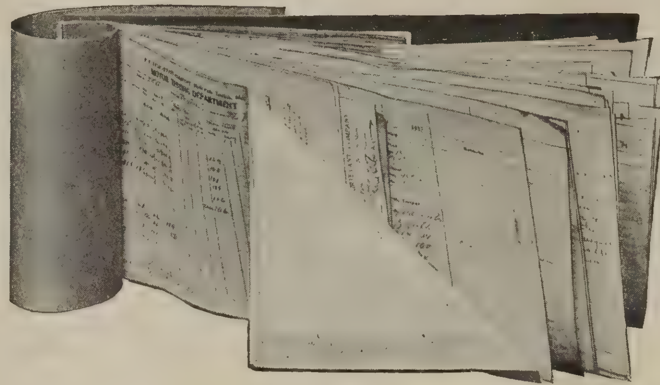


1. *Chorus*—"We've had a perfectly lovely time, and will come and see you again next summer, sure. Good-by!"

2. *Uncle Si*—"Comin' ag'in next summer, eh? Not if I know it. It was bad 'nuff before; but since that old automobile's come, life ain't wuth livin'. Maria, I'm goin' to sell out and move!"

3. *Uncle Si* (after the move)—"It'll be some trouble goin' down to the fields on the bottom land; but, Maria, old gal, no old automobile's ever got the power to climb up to this roost. Hooray!"

4. *Chorus*—"Here we come, Uncle Si. What a fine, airy place your new home is."



300 Tests Provided Data for Designing Sturtevant Aeroplane Motor

The Sturtevant 140 H.P. Aeroplane Motor is not merely a design, it is a development — a development that required more than 300 tests and when determining the details we had available the record and performance of the engine under all conditions of service. Each new improvement or change was tested out thoroughly till every weakness was eliminated.

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140 H. P. Aeronautical Motors

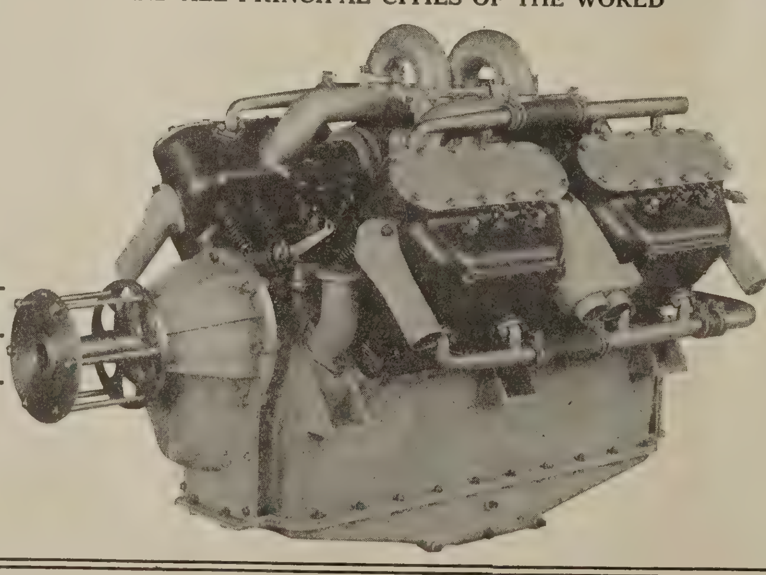
The 140 H.P. Motor is just as near perfection as we can make it, and it has made good in actual service.

At the Sturtevant plant every aeroplane motor passes the most careful inspection and undergoes the most rigid tests. Our test house and facilities for testing are much superior to those of our competitors. All tests are run in such a way as to duplicate flying conditions as nearly as possible. Careful records are kept of the tests on each engine and these can be referred to by the purchaser at any later date. In fact, we are anxious to have purchasers' representatives present at the final test and to give them a carbon copy of the test figures as we have absolutely nothing to hide.

Sturtevant Motors develop their full rated horse power. This is proved abundantly by test figures.

B. F. STURTEVANT COMPANY, Hyde Park, Boston, Massachusetts

AND ALL PRINCIPAL CITIES OF THE WORLD



(Continued from page 78)
weeks, and while not experts, can be of real value if there should be a need for aviators at the Mexican border.

The following civilian aviators have volunteered their services, and are taking a course of training to get their expert license, and are holding themselves in readiness, subject to call by the War Department:

W. Leonard Bonney

holding Pilot License No. 47, issued by the Aero Club of America. Mr. Bonney has just returned from 11 months' service in Mexico as the head of the aviation section of Gen. Carranza's Army, and is now at Newport News supervising the instruction of the following civilian licensed aviators and obtaining his own "Expert" Certificate:

Beryl H. Kendrick

holding Hydro-Pilot License No. 34, issued by the Aero Club of America. Mr. Kendrick is now at Palm Beach, Fla., engaged in passenger carrying, but will report about March 25 at the Curtiss Aviation School, for instruction on high-powered aeroplanes, and to obtain his "Expert Certificate."

William Bouldin 3d

holding Pilot License No. 157, issued by the Aero Club of America. Mr. Bouldin is now preparing to leave for Newport News, Va., where he will take instructions at the Curtiss Aviation School on high-powered aeroplanes, and obtain his "Expert Certificate."

Robert G. Fowler

holding Hydro-Pilot License No. 36, issued by the Aero Club of America. Mr. Fowler, who has been flying the Burgess-Dunne seaplane, owned by Harry Payne Whitney, and who is now engaged in aeroplane construction work in New York City, is preparing to leave for Newport News, Va., where he will take instruction at the Curtiss Aviation School on high-powered aeroplanes, and obtain his "Expert Certificate."

Marshall Earle Reid

holding Pilot License No. 114, issued by the Aero Club of America. Mr. Reid, who is a well-known Philadelphia sportsman, is one of the pioneer aviators, having learned to fly a Wright machine in 1912. Mr. Reid was one of the first to volunteer his services and expects to go to Newport News, Va., where he will take instruction at the Curtiss Aviation School on high-powered aeroplanes, and obtain his "Expert Certificate."

Mr. Ferdinand Eggena

holding Pilot License No. 333. Mr. Eggena is now at Buffalo, and is holding himself in readiness to go at the call of the Aero Club, to the Curtiss Aeroplane School at Newport News, Va., to receive instruction on high-powered aeroplanes and obtain his "Expert Certificate."

D. R. J. Hassell

holding Hydro-Pilot License No. 20, issued by the Aero Club of America. Mr. Hassell promptly communicated his willingness to volunteer for Mexican service to the Aero Club of America, upon learning that the licensed aviators were being mobilized. Mr. Hassell is now in Wisconsin, and is preparing to report at Newport News to obtain his "Expert Certificate" at such time as the club may desire. Last summer Mr. Hassell placed his Curtiss flying boat at the disposal of the Wisconsin Militia during its manoeuvers.

A. J. Brubaker

holding Pilot License 283, issued by the Aero Club of America. Mr. Brubaker is at present in New York and is holding himself in readiness to go immediately to Newport News, upon instructions from the Aero Club, to qualify for his "Expert Certificate."

J. Guy Gilpatric

holding Pilot License 171, issued by the Aero Club of America. Mr. Gilpatric is one of the best known of the New York aviators, at present in Canada. Mr. Gilpatric has wired Mr. Bonney that he is prepared to report for special instruction on high-powered machines at any time his services are required in Mexico.

Chris J. Peterson

holding Pilot License No. 270, issued by the Aero Club of America, who has three years' experience in mountain air currents similar to those of northern Mexico, wires he is ready for service at any time. Mr. Petersen will no doubt be sent to an aviation school to qualify for an "Expert Certificate."

Roderick M. Wright

holding Pilot License 254, issued by the Aero Club of America, has communicated with the club his willingness to devote his energies to military service. Mr. Wright is at present at Augusta, Ga., where he is acting in the capacity of instructor at the Wright Aeroplane training school.

K. A. Bergenthal

holding Pilot License No. 222, issued by the Aero Club of America, wired from Augusta, Ga., that he is finishing special training in military machines and would like to join immediately the group of aviators preparing for Mexico. Mr. Bergenthal was requested to obtain the "Expert Certificate," that he might be immediately available in case of need.

Joe Graham Trees

Mr. Trees is a young Pittsburgh sportsman, son of the well-known Pittsburgh millionaire, J. C. Trees, wires from Augusta, Ga., offering his services and his new high-powered military type machine for service in Mexico. Mr. Trees is now taking special military training at the Wright Aviation School that he may qualify for his "Pilot" and "Expert" Certificates.

Earle L. Doherty

holding Pilot License No. 87, issued by the Aero Club of America. Mr. Doherty is one of the earlier pilots, and is now at Long Beach, Cal., instructing. Mr. Doherty will report at the Martin School of Aviation at Los Angeles, Cal., to receive instruction on high-powered aeroplanes and obtain his "Expert Certificate."

B. B. Lewis

holding Pilot License No. 345, issued by the Aero Club of America, has wired his intention of immediately qualifying for an "Expert Certificate," "with a couple of loops thrown in." Mr. Lewis is a well-known New York sportsman, and learned to fly a Wright machine in 1913, and is considered one of the most skillful Wright pilots. Being on the Pacific Coast, preparatory to a flight across the country, Mr. Lewis will take his "Expert Certificate" at San Diego or Los Angeles.

Capt. H. Worden

holding Pilot License No. 76, issued by the Aero Club of America, has wired from Dallas, Texas, that he holds himself in readiness for immediate service at the order of the Aero Club. Captain Worden, besides being one of the more experienced pilots, is especially valuable for the Mexican Army under Gen. Huerta, on whose staff he was Captain. Captain Worden will probably be assigned to Los Angeles or San Diego to qualify for his "Expert Certificate."

Members of California Naval Militia holding pilots' certificates:

A. C. Burns

holding Pilot License No. 370, issued by the Aero Club of America, is qualifying for his "Expert Certificate" at the Martin School of Aviation, Los Angeles, Cal.

Ed. Musick

holding Pilot License No. 369, issued by the Aero Club of America,

(*Continued from page* 90)

The Schultz Speed Model.

The speed model shown in the accompanying drawing was constructed by Mr. Harry Schultz, also a member of the Aero Science Club. This model proved to be a very consistent flyer, having been flown by Mr. Schultz in many contests.

The fuselage is constructed of ¼ by 3/16 spruce, and is 30 in. in length. As shown, it is of the usual triangular form and is braced by two bamboo strips, the front one being 9 in. from the apex of the triangle and the rear one being 10 in. from the rear of the frame. The propeller bar is of bamboo and is 7½ in. in length and ¼ by ⅛ in. in thickness. The bearings, which consist of ½ in. lengths of tubing, are secured to the propeller bar by binding very tightly with silk thread, then coating with Ambroid glue.

The tail plane, is constructed of ⅛ in. square bamboo, and is of a triangular form, the triangle being formed by strips extending from the propeller bar to the rear brace and being secured thereto as shown. The front plane is constructed of 1/16 in. flat steel wire and has a main beam extending across the same on the under side, of spruce 3/16 by ⅛ in thickness.

Both planes are covered with goldbeaters skin, sometimes known as Zephyr skin, and treated with Ambroid.

The chassis is of a very simple form, as shown, and is constructed of ⅛ in. square split bamboo cut to streamline form. The wheels are ¾ of an inch in diameter and are of cork; fitted with small pieces of tubing for hubs. The propellers are carved from white pine and are 7 in. in diameter, with a pitch of approximately 13 in. Each propeller is driven by 10 strands of ⅛-in. flat rubber.

(*Continued from page* 86)

peaks, the more the aviators encounter the rarefied currents of air, telling both upon the lungs of the operator and the stability of the machine. An expert aviator, in discussing the difference in the altitude to which the aviators are accustomed to climb and the unusual altitude that must be reached for any observation work in the Sierra Madres, said:

"The aviators are not accustomed to such thin air. There are treacherous currents and air pockets to be encountered that were not calculated on before. Not only must the aviators themselves become accustomed to the changed conditions, and this by tryouts, but their machines will have to be adjusted to meet the unusual conditions of a high altitude.

"A man not used to mounting upward of 5,000 and 5,500 feet, and in the Sierra Madres he will have to climb even higher to learn anything of the topography or the whereabouts of the enemy, is in danger of wrecking his heart by the sudden change and the lifting of the blood pressure.

"We know that air machines are working remarkably in the European war, but the altitudes in which they operate are always slightly above the sea level. We have no record of European operations where the air planes have been operating at such a height, save for spectacular and not practical purposes. Air planes sent up in the Alpine Mountains have never returned. The tall peaks and deep canyons cause unexpected eddies and air currents, which the aviators are unable to contend with."

One of the army aviators, speaking at the headquarters in Colonia Dublan, also said that only in the Alps are aviators now with the great armies of Europe likely to encounter conditions similar to those with which the members of the First Aero Squadron must contend.

"Never," said this aviator, "have we had any flying as difficult as here. We are under a handicap of an altitude of about 5,200 feet when we rise. Some of the mountains we have tried to get over are approximately 9,000 feet above sea level, and none of our machines is powerful enough to carry the pilot, observer, and sufficient fuel at such an altitude. We might get over one of the high mountains, but we probably would be unable to carry enough fuel for the return flight."

The aviators themselves believe that their work of gathering and transmitting information is a more difficult duty than being under actual fire. The chances of being hit while under fire in this country they estimate at "about a million to one."

The European planes in the Alpine work, they have been informed, carry especially powerful motors designed for mountain observation duty. Furthermore, in the Alps, if an aviator, after an accident, does succeed in landing, he stands a chance of capture, but in any work they may undertake against Villa the American aviators are not counting on saving their lives if they should be forced to descend within reach of bandits.

For a time last week the aviators were unable, on account of the high winds, to do any scouting in the zone of operations. The wind was too strong to stay up, and if, perchance, one were able to do so, the clouds of dust and sand obscured the landscape and made the danger of getting lost more than a possibility.

AERIAL AGE
WEEKLY

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The Proposed Department of Aeronautics Endorsed by Aero Club of America

The following hearty endorsement of the measure introduced in Congress providing for the establishment of a Department of Aeronautics and a Secretary of Aaeronautics is given by Messrs. Alan R. Hawley, and Henry Woodhouse, of the Executive Committee of the Aero Club of America, who gave thorough study to the measure and explained the importance of having aeronautics in a separate department and under a separate head.

The letter, which is addressed to Congressman Charles Lieb, of Indiana, the author of the bill, follows:

HON. CHARLES LIEB,
House of Representatives,
Washington, D. C.

MY DEAR MR. LIEB:

The Executive Committee of the Aero Club of America has read and considered with great interest your Bill (H. R. 13838), which provides for establishing "at the seat of Government an executive department known as the Department of Aviation, and the Secretary of Aviation, who shall be the head thereof."

We are in hearty accord with the purposes of this measure, for the following reasons:

(1) Although the aeroplane, the hydroaeroplane, and the flying boat were developed by Americans; and although the United States Army acquired its first aeroplane in 1909, and this was the only country to have an aeroplane in its Army for close to two years; and the United States Navy first acquired a hydroaeroplane in 1911, and for many months was the only Navy in the world having a hydroaeroplane; although we probably have more reasons for having a substantial air service, and more resources for developing same than any other country in the world; we find to-day that we have no organized air service to meet an emergency. Neither the Navy nor the Army has ever had an opportunity to manœuvre with this important arm. Our artillery is without aerial "spotters." The Panama Canal, Guantanamo, Porto Rico and Guam have no aerial protection. A few aeroplanes were sent recently to the Philippines, but not enough either in equipment or personnel to be of any value. Each of these important naval bases should have aviation centers with between twenty to forty aeroplanes at each base.

There should also be dirigibles, observation balloons and kites, of which the Army and Navy have none, the small dirigible owned by the Navy being only a training dirigible.

(2) Other countries have "Departments of Aeronautics" in charge of a Secretary, who is advised by a staff of competent Army and Navy authorities, or of a committee of competent authorities, the Chairman of which virtually holds a position equivalent to that of the Secretary of Aeronautics. Germany first established the Department of Aeronautics in 1913, when the Reichstag allowed $35,000,000 for aeronautics. The fact that France and England, which only realized the necessity of having a Department of Aeronautics after the war had started, have found, after various changes, that the most satisfactory arrangement is to have aeronautics developed under the direct charge of an independent body of Army, Navy and civilian experts, headed by a competent head, shows the wisdom of the proposed measure.

The difficulty experienced by these countries, as well as Italy and France, in immediately finding competent authorities to form a staff capable of directing the development of aeronautics, when the tremendous value of this arm was demonstrated, should be a lesson to this country. We should not wait until trouble overtakes us to look for suitable men to fill the important positions in the Department of Aeronautics. To do so would be fatal.

(3) The aircraft makes every place an aerial port, therefore every place can become a target to the enemy's aerial bombs. Six years ago the British Isles were considered invulnerable, England having command of the sea. Had some one said in 1909, when Bleriot made his modest flight across the English Channel, that within a decade England would be made vulnerable by the development of aircraft and her cities would become targets for aerial bombs, the world would have laughed and denied the possibility. It has been estimated that over 5,000 flights have been made across the English Channel by British military aeroplanes in the past twelve months. A fleet of eighty aeroplanes once crossed from England to France in fleet formation.

This year England is spending over $1,000,000,000 in aeronautics, $25,000,000 of which is being spent in the United States, and France is spending $66,000,000. These large expenditures will develop still larger and more efficient aircraft and aero motors for use in peace and war.

Within a short time, possibly this year, somebody will cross the Atlantic by air. There are huge flying boats being built in this country which would be capable of flying across the Atlantic, and the details for just such a flight are being completed.

Within ten years our shores will be exposed to aerial attack from aircraft, as the British shores are to-day.

We shudder at the thought of what would happen if Villa had aeroplanes. As we have no air service, and no aircraft guns, the lives and property of people living in New Mexico, Arizona and Texas, and the lives of our soldiers who are participating in the Villa hunt would be in grave danger.

Until recently a war could take place at any of our seaboards and the people inland were immune from harm. The aircraft have removed all "safety zones." The aircraft selects its own target and cities in the interior are just as vulnerable from attack as cities on the seaboards. The hundreds of Zeppelin and aeroplane raids in the present war have shown that even now an enemy fleet coming to attack our shores could launch hundreds of aeroplanes from ships and bombard New York, Washington, Pittsburgh, Boston, Philadelphia, Richmond, Charleston, and other important cities from the air—against which these cities would be defenseless. The U. S. Navy, having no air service and anti-aircraft guns, would itself be at the mercy of smaller enemy fleet.

(4) The Army and Navy bills now before Congress show

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

the need of having a separate department for aeronautics, a department which will co-ordinate our aeronautical resources to solve the otherwise difficult problem of providing aerial defense for our coasts. Considering the Army and Navy bills, we find that no provision is made for aerial coast defense because, as Rear Admiral Benson told the Committee on Naval Affairs, coast defense is one of the Army's duties, and the Navy will, therefore, confine itself to a plan intended to supply only air scouting for our fleets. On the other hand, the Army is denied a sufficient appropriation for aeronautics because there is a fallacious obsession that the air service must be proportionate to the size of the Signal Corps, under which the air service has been kept, and because the Army is very short of officers and men.

A Secretary of Aeronautics would solve the problem quickly by co-ordinating the aeronautical resources of the Army, Navy and Militia, and hastening the development of a Coast Guard Aerial Corps, such as is proposed by H. R. 13830; of the project to carry mail by aeroplane in the hundreds of localities where the aeroplane can solve difficult problems of transportation of mail; and of registering and mobilizing civilian aviators and private owners of aeroplanes, so that their services and their aeroplanes would be available in case of war.

(5) With five thousand aeroplanes this country would be placed in the safe position of the porcupine, which goes about its daily peaceful pursuits, harms no one, but is ever ready to defend itself. This fact is appreciated by the general public and the general opinion, we find, is that we ought to get this number of aeroplanes as soon as possible, employing as many as possible for peaceful purposes.

The basic purpose of the Department of Aeronautics would really be to foster the development of the different branches of aeronautics, co-ordinate the efforts of organizations and individuals, and mobilizing the resources so as to provide an economic and efficient system of aerial defense.

(6) Nothing else could give to the United States a system of defenses so quickly and cheaply as aeronautics can give.

With the increase of size, power, carrying capacity and armoring of aircraft, the cost increases in proportion. But the fact that the aircraft has the advantage of attacking from above, hitting the most vulnerable places, and is able to reach any place, flying over obstacles that would prevent the advance of troops or ships, makes the aircraft many times more effective and economic than any other arm.

When the problems of immediately improving the national defenses are considered there is found that aeronautics affords possibilities for quick developments and immediate relief at only a fraction of the cost of developing other arms. In the words of an authority who recently returned from Europe, where he made a special study of the subject, "Of all the weapons produced by this war, the aeroplane is the most efficient. It protects, it destroys, it fights. It is the super spy, super scout, super belligerent."

(7) We also believe that the establishing of a Department of Aeronautics would solve to a great extent the problem of recruiting the necessary personnel with the regular and volunteer forces needed for our national defenses.

There are already thousands of men who are considering taking up aviation, but who would not take up the general military training unless aviation is part of it.

The European War has taught the American nation that so long as there are ten nations having armies of between 1,000,000 to 5,000,000 well-trained and well-equipped men and the United States has less than 500,000 well-trained and equipped men; and there are four nations that have navies superior to the United States Navy, which also have a substantial reserve of merchant ships; while we have none—every man knows that so long as these conditions exist, he must prepare to personally assist to meet an emergency.

This feeling has brought the institution of training camps and hundreds of men who are considering taking up military training are coming to the conclusion that they can be of most use if they learn flying. The average man finds that after he has had two years of military training he is worth about half a soldier. On the other hand, he finds that if he takes a course of training in aviation, at the end of six weeks, as soon as he can pilot his machine alone, he is worth 100 soldiers; at the end of six months, when he is able to fly across country and drop bombs, he is worth 500 soldiers; at the end of a year, when he is an expert pilot and has also learned military tactics, he is worth a thousand soldiers.

Realizing this, many business men and sportsmen are learning to fly, and many are acquiring their own aeroplanes. From their expressions, as well as from the hundreds of applications that we have received from men who would like to join an aviation reserve, we have deduced that it would be easier to get personnel, officers, as well as enlisted men, for air service than it is to get them for the Army and Navy.

(8) The following brief definition of the status of aeronautics in the United States is given to facilitate the understanding of the resources which the Secretary of Aeronautics could co-ordinate to form an effective force:

(a) *Army Aeronautics.* Consisting of a very small organization, having at present only two aeroplanes in commission and less than twenty trained men available for service. There is only one Army aviation school, at San Diego, located on a field belonging to private owners, who may need it any day.

(b) *Navy Aeronautics.* Consisting also of a small organization, with less than twenty aeroplanes in commission; a single hangar-ship, and a small training dirigible. The Navy has only one aeronautic station, at Pensacola. It has an efficient but too small aerodynamic laboratory.

(c) *Militia Aeronautics.* This was started by the National Aeroplane Fund insistuted by the Aero Club of America last year, when Congress went out of session without providing for the development of aeronautics in the Army and Navy.

The National Aeroplane Fund has supplied the funds for starting aviation sections in the National Guard of thirty States. Officers of the National Guard of the following twenty-two States are at present receiving free courses of training in aviation, the National Aeroplane Fund paying their expenses: Connecticut, Nebraska, North Carolina, Vermont, Mississippi, Tennessee, Colorado, Arkansas, New Hampshire, Ohio, Oklahoma, Virginit, Kentucky, Oregon, Texas, West Virginia, Minnesota, New York, Georgia.

Thirty States are now anxious to organize aviation detachments in the National Guard and Naval Militia, and are applying to the Aero Club of America for assistance in getting aeroplanes and equipment. In most cases the Militia authorities had been trying for a long time to get aeroplanes, but

(*Continued on page* 127)

Aeronautic Federation of Western Hemisphere Organized

A CABLE received by the Aero Club of America from Santiago, Chile, advises that as a result of the aeronautical conference held there, which was attended by members of the Aero Clubs of different countries of the Western Hemisphere, there has been organized the Aeronautic Federation of the Western Hemisphere. The cable states that Mr. Alberto Santos-Dumont, the famous Brazilian sportsman and inventor, who represented the Aero Club of America at the conference, has been elected Honorary President, and Mr. Cortlandt F. Bishop, Vive-President of the Aero Club of America, has been elected Vice-President of the Federation and Secretary General.

The Aeronautic Federation of the Western Hemisphere will have its offices and headquarters at 297 Madison avenue, New York City, the Governors of the Aero Club of America having extended to the Federation the use of the Club House, its facilities and its extensive aeronautic library, which is acknowledged to be the best in the world.

The Aeronautic Federation of the Western Hemisphere is essentially a union of the clubs and societies that control aeronautics in their respective countries in all the nations of the American Continent.

The Federation is charged with the regulation of aeronautics on the American Continent.

The Federation is directed and administered by a board composed of a president, of ten vice-presidents, of a secretary general, of a recording secretary, of a treasurer, and of five delegates from each country. The secretary general and the treasurer must reside at the seat of the Federation, which is established in New York. Every national club or society will nominate five delegates, who shall be designated as sportive, scientific, military and commercial, respectively.

A conference, composed of delegates from affiliated clubs or societies, will be held each year, in different countries, if possible.

The constitution provides for complete co-operation between the nations of the hemisphere in every respect.

Recently the Aero Club of America offered a $10,000 Pan-American Aviation Trophy, to be competed for by the representatives of the different countries, the first contest for which is to take place at Rio de Janeiro, Brazil. This offer represents the first step taken towards uniting the nations of this hemisphere through sport.

Do Not Forget to Bid for the Aero Mail Carrying Project!

The News of the Week

Army Aviation Corps To Be Reorganized

Secretary of War Baker has announced that the Aviation Corps of the Army will be reorganized in an effort to improve its material, and to give it the means for efficient service that this branch of the army deserves in view of the importance of aviation in modern warfare.

Lieut. Col. George E. Squier, now Military Attaché at London, but who for some years was attached to the Signal Corps during its early experiences with heavier-than-air crafts, has been ordered to return to Washington in connection with this experiment.

The aviation service has been under investigation by a board of army officers, following a court-martial on the Pacific Coast which developed a course of carelessness. Secretary Baker declined to state the duty to which Colonel Squier would be assigned in connection with aviation, but the impression was strong here that he would be placed in charge of army aviation work, which is now under Lieut. Col. Samuel Reber. The report of the board of investigation will be pubished this week. To facilitate reorganization work for the army corps, Secretary Baker, by direction of President Wilson, has appointed a special aviation board, which has convened and organized in Washington, to study the science of aviation, to revise the army regulations dealing with aviation, and to study the attitude of the army toward the development of its aviation arm. Secretary Baker said he hoped the work of this board would be constructive. The members are Captain Virginius E. Clark, who has been on duty at the Signal Corps Aviation School at San Diego, and Lieutenants Thomas De Witt Milling and Byron Q. Jones, both of the cavalry branch of the service, but detailed for aviation duty. Lieutenant Jones has just completed a special course in aerodynamics at the Massachusetts Institute of Technology, and is an experienced aviator. Lieutenant Milling is considered one of the ablest and most daring aviators in the world.

The aviation board also will study the organization of the personnel to a certain extent. During a conference with the board its members told Secretary Baker they considered it wise to provide for the admission of civilian aviators into the army. Existing law limits the number of military aviators to sixty. The law provides that no officer who is more than thirty years old shall be assigned to aviation duty, and all such assignments to the aviation corps are voluntary.

It has been impossible to obtain sixty aviators for the army under this law, mainly because the age limit is too low, and it is not considered avdisable to raise the age limit above thirty. To make up the difference between the sixty allowed by law and the smaller number of aviators now in the service, the aviation board urged Secretary Baker to ask Congress to modify the law so as to permit the enlistment of outsiders—civilian aviators—for the army.

It was admitted that the creation of this Aviation Board was partly the result of the American punitive expedition into Mexico, which already has demonstrated the weakness of the Aerial Corps of the American Army, especially of its material. The expedition entered Mexico with eight aeroplanes, and only two remain available for present service with the expedition. Two of the original eight aeroplanes taken into Mexico have been destroyed in accidents, and four others cannot be used because they are incomplete and need spare parts.

Lieut. Saufley's Altitude Record

The Navy Department at Washington on March 29 received a dispatch from the Naval Aeronautical Station at Pensacola, Florida, announcing that Lieut. Richard C. Saufley, U. S. N., had in a hydroaeroplane flown to a height of 16,072 feet, a new record for hydroaeroplanes.

On Dec. 3, 1915, Lieut. Saufley had established an altitude record of 11,975 feet.

Exports of Aeroplanes

During the last week the exports of aeroplanes from the port of New York totaled $170,090. Of this sum $11,000 were sent to France and $159,000 to England.

Colonel Glassford in Charge of North Island School

Colonel W. A. Glassford, former Chief of the Signal Corps of the Western Department, with headquarters at the Presidio of San Francisco, has assumed command of the North Island Aviation School, relieving Captain Arthur S. Cowan.

New Sloane Tractor at Garden City

One of the new Sloane Military Tractors has been shipped to Garden City for flight demonstrations during the next week. It is of the type which was recently shipped to England and which made such a splendid record for rapid climbing and high speed. This machine is equipped with a Model A-5 Hall-Scott motor, and local experts are awaiting the air tests with a great deal of interest, because it is believed that the new wing curve which is being used will produce some climbing and possibly some speed records.

The well-known aviator, De Lloyd Thompson, has been engaged by the Sloane Company for these tests.

100 Hour Test of Curtiss Motor

A model "VX" Curtiss motor, rated at 160 horsepower, has just completed a 100-hour test under the observation of official inspectors.

The motor was first given five consecutive non-stop runs of 10 hours each, after which it was disassembled for inspection.

On re-assembly, a 50-hour non-stop run was successfully conducted. The horsepower developed was always more than 160.

This is the same motor used by Aviator Victor Carlstrom when he flew from Toronto, Ontario, to New York City, last November.

The Russian purchasing commission on their recent visit to Newport News. Third from the left is Glenn H. Curtiss; fifth from the left is Captain Thomas S. Baldwin

Antony Jannus, Curtiss Representative in Russia

After a stay of only ten days in this country, Antony Jannus, who has been an aeronautic engineer at Sebastopol, Russia, for the Curtiss Company, sailed on April 1 for Russia, where he will now open an office and be the company's representative. The constantly increasing demands of that great nation for aeroplanes and parts makes the position of Mr. Jannus, as the Curtiss representative, one of great importance and of obvious opportunity.

On his return trip Mr. Jannus was accompanied by Lieut. V. V. Utcoff, who has been in this country some time as the Russian Naval Aeronautical Attache.

The Eastern Trailmobile Sales Co.

The Eastern Trailmobile Sales Co. has opened an office at 1876 Broadway, New York City, to care for the Trailmobile business in the East. The Trailmobile, as recently described in Aerial Age has a wide range of usefulness and is particularly adaptable for the overland transportation of planes, and the equipment. In the recent cross-country flight of the First Aero Squadron from Oklahoma to Texas these vehicles were used as a part of the equipment which followed by land.

Hall-Scott Motors Make Two Five-Hour Non-stop Runs

Two five-hour non-stop tests have been made by the A-5 Hall-Scott motor at the Washington Navy Yard, meeting all the requirements of the Aeronautical Department of the Navy.

The first test lasted five and a half hours and the second lasted five hours and ten minutes and both tests were carried out under very severe weather conditions. In both cases the motors maintained an average horsepower of well above the 120 h.p. class in which the motors were placed, the maximum horsepower developed with the only propeller at hand which allowed the motor to turn over 1,265 r.p.m. was 131 plus brake h.p.

Robert Simon Instructor of Rhode Island Militia Aviators

Robert Simon, who recently qualified for his pilot's license at the Curtiss Aviation School, North Island, San Diego, Cal., has been appointed instructor of the aviation corps of the Rhode Island Naval Militia. The Militia have already secured two Curtiss Flying Boats and it is expected that rapid progress will be made in the tuition of students.

Oscar A. Brindley Marries Miss Oliver

Oscar A. Brindley, who piloted the Martin seaplane to success in the Curtiss Marine Trophy last summer, was married to Miss Nan M. Oliver, of Washington, Penn., at San Diego a few days ago.

We extend to Brindley the hearty congratulations of all his wide circle of friends.

Buffalo to Have Aviation Meet

Buffalo will witness this summer one of the largest aviation meetings ever held in the United States, if plans now being formulated materialize. The old Kenilworth race track, formerly owned by the late August Belmont, has been leased for the event, from July 10 to 22, inclusive.

Ferd. Eggena, a member of the Aero Club of America, American Society of Aeronautic Engineers, and a licensed pilot, will have charge of the meet. The Aero Club has unofficially suggested that $134,000 in prizes be offered to tempt the greatest fliers in the world to compete in Buffalo.

Kenilworth Park is an ideal spot for the purpose, located on the beautiful new Niagara Falls Boulevard, within easy reach of the city, and will, with grandstands and parking space, accommodate 30,000 people. It is planned to concentrate the aeroplane interests from all over the country, including the manufacturers of the aeroplane, motors and accessories, in a monster exhibition, for which special buildings will be erected.

According to Mr. Eggena, "It will give the inventor or the small manufacturer an equal chance to bring his ideas or work before the public, which he or they cannot do through the medium of an advertisement." Buffalo newspapers have been giving the plan considerable publicity.

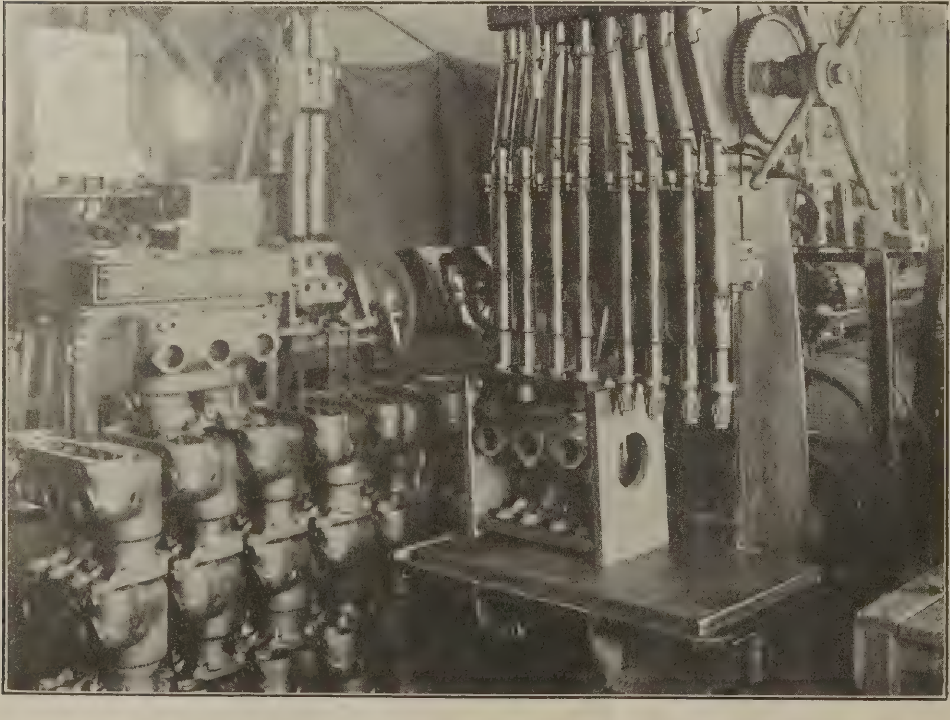
Hamilton Aero Mfg. Co. Busy

The Hamilton Aero Mfg. Co., of Vancouver, Canada, are fast at work building five (5) machines of the type illustrated in another part of this issue. They are being built for the B. C. Aviation School. Curtiss and Maximotor power plants are being used.

The B. C. Aviation School, Ltd., has more than a dozen students already enrolled and many more applications. A very large aviation field has been procured adjoining a smooth stretch of protected bay. Besides the actual training on machines of all types for military use, the students are being instructed in the theory and shop training, as well as wireless, nautical navigation, etc. Most of the students now enrolled are enlisted and expect to join the Royal Flying Corps on completion of their course.

Michigan Military Training Organization to Purchase Aeroplane

The Military Training Organization, of Detroit, Michigan, has raised a fund to purchase an aeroplane, to maintain it properly, and to give free tuition to properly accredited members of the Michigan National Guard and of the Michigan Naval Reserve, the object being to develop military and naval pilots and observers. The secondary object of this work will be to train a certain number of civilians, if time permits, who must join a voluntary aerial reserve, which shall be at the call of the Government.



A Thomas 135 H. P. Aeromotor twin cylinder casting in place in a box jig arranged for boring the valve chambers. This work is done on an eight spindle boring machine specially designed for this class of work

Flight of 300 Miles in Four and One-Half Hours

By flying from Newport News, Va., to Washington, D. C., and return in four and one-half hours, Stephen MacGordon, of New York, an instructor in the Curtiss training school at Newport News, established a new and a remarkable record for cross country flying. He made the trip without stopping his engine, and he carried with him a passenger in the person of Lieut. Vivian Hewett, of the British Royal Naval Service, who is in this country inspecting machines for the British Government.

The flight was made on Saturday, April 1. The distance as the crow flies is 300 miles. Though the machine was actually in the air five hours and five minutes, 35 minutes of that time was made, Mr. MacGordon says, in altitude flights. The machine left Newport News at 10:20 A. M. and returned at 3:17 P. M., but it was not until 3:25 that a landing was made.

Mr. MacGordon says he arrived in Washington at 12:33 o'clock and started back after circling twice over the Capitol. The machine was 3,000 feet in the air when it left the Virginia coast, but made the return trip at an altitude of 10,000 feet.

The feat wrests the cross country flight passenger carrying record from Lieut. Dodd of the United States Army. Dodd flew from San Diego, Cal., to Burbank, Cal., a distance of 244.18 miles, on February 14, 1914, with a passenger.

The machine used by Mr. MacGordon was of the type of those being built here by the Curtiss company for the British and Russian Governments. It is the most modern type of military tractor in the United States and has a 160 horsepower engine.

Test of Army Aeroplanes Before Shipping

The hydroaeroplanes being sent from the works of the Burgess Company, in Marblehead, Mass., to the border for use in Mexico were tried out in a trip between Marblehead and Salem, Mass., on Saturday, April 1, under the supervision of Army officials, from Waashington.

Frank Johnson, who saw service in the Russian Army, and Clifford N. Webster, made the trip from the works of the Burgess Company in Marblehead. They attained an altitude of 700 feet and a speed of eighty miles an hour. During the trip daylight smoke bombs were dropped, four of them striking on the mills of the Naumkeag Company in Salem, one on a shoe factory and another on top of a dwelling.

Hall-Scott A-5 Delivers 145 H.P.

The eight motors of the A-5 type which were recently delivered to the Pensacola Aeronautical Station were tested at the Hall-Scott factory in San Francisco by the U. S. Naval Inspectors. The test required non-stop two-hour runs, the last hour to develop 1,475 r.p.m. At this speed the motors developed in excess of 145 brake h.p.

The Atlantic Coast Aeronautical Station

The Atlantic Coast Aeronautical Station is extending considerably under the able management of Captain Thomas S. Baldwin—who is now a regular general, and directs things like one.

Training under Messrs. Carlstrom, Mac Gordon, Costo, and Cogswell, is being given on three 100 h.p. Curtiss tractors. A 160 h.p. tractor is also used. Messrs. Lees and Vernon are giving instruction on 100 h.p. flying boats, the former's with Curtiss control and the latter's with "Dep." The flying boats also carry passengers.

In addition to these regular machines, there are three experimental types and one twin-motored 320 h.p. flying boat. The latter is to be flown by Mr. Macauley. The experimental machines are one large 160 h.p. "pusher," quite speedy; one twin-motored tractor with 100 h.p. "Tabloid," single passenger, tractor, having only a little over twenty feet of wing spread.

Several more machines and instructors are expected.

The Aero Club of America, by paying the expenses of the Militia Officers, enabling the States to accept Curtiss's free course of training, has turned Newport News into a training camp for Militia Officers.

First Aviator in the National Guard of Kansas

L. Phil Billard, of Topeka, Kansas, has received his commission as a captain in the aero corps of the National Guard of Kansas. At present he is the only member of the flying service of the militia in his state, but in Kansas, as in other states, the rapid development of this branch of national defense is looked for and the commission is therefore an important, as well as an honorable, one.

Mr. Billard and A. K. Longren, of the Longren-Taylor Motor Car Company, one of the best known aeronauts of the Middle West, have joined their interests, and hereafter Longren will do no more flying, while Billard, with a machine to cost approximately $10,000, will give exhibition flights in the larger cities.

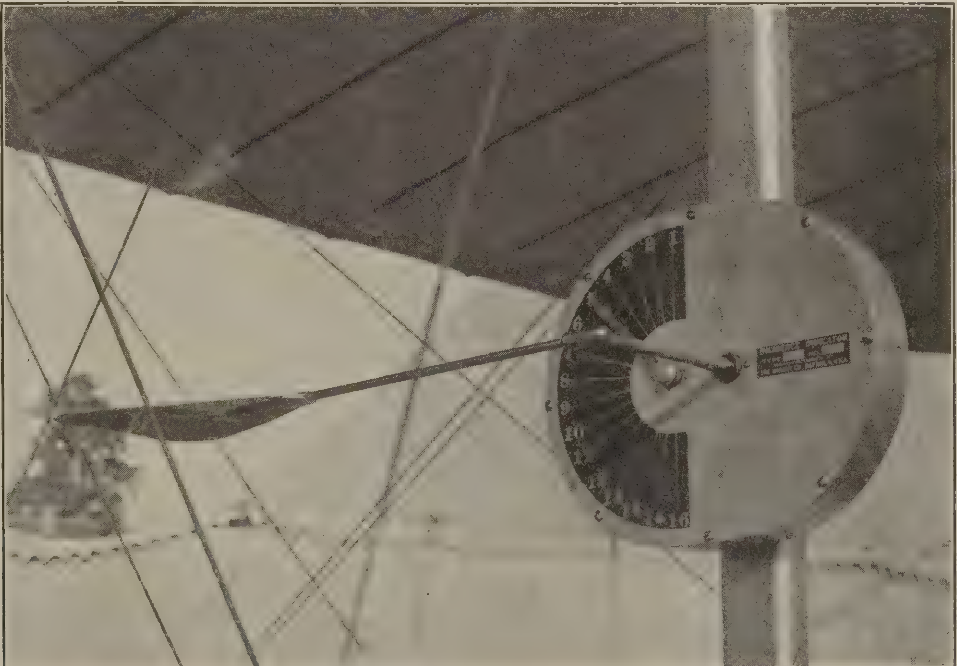
The Packard Aeronautical Engineer Off for Mexico

William R. McCulla, aircraft motor engineer for the Packard Motor Car Company, left Detroit on March 30 for Mexico to render assistance to the government on mechanical and aerial transport. On account of the experience he gained during a visit of ten months to the war fronts in Europe Mr. McCulla should be able to render invaluable assistance to the First Aero Squadron at this time.

Grand Rapids Aviation Activities

Mr. Anthony Stadlman, one of the Chicago aeroplane builders, and his assistant, Mr. Joseph L. Lucas, of the Illinois Model Aero Club, are at present in Grand Rapids, Mich., rebuilding a Benoist flying boat. The machine will be used during the summer for school work. Mr. Budd Morris and Mr. H. Powers, Chicago aviators, will be in charge of it. The work is being financed by wealthy business men of Grand Rapids.

The Incidence Indicator now used on the Wright machines.



THE TRANS-ATLANTIC FLIGHT PROJECT

MR. RODMAN WANAMAKER has advised Mr. Alan R. Hawley, President of the Aero Club of America, that he has ordered a large aircraft, and will carry out the plans made before the present war to cross the Atlantic by flight. Mr. Wanamaker's letter folows:

New York, April 1, 1916.

ALAN R. HAWLEY, ESQ.,
President Aero Club of America,
297 Madison Avenue,
New York City.

DEAR MR. HAWLEY:

Supplementing my letter of February 4, 1914, to the Aero Club of America, signifying my intention of making a purely scientific test of aeronautical power by crossing the ocean in one flight, I beg to advise you of the following developments:

1st. Lieutenant (now Commander) John C. Porte, who was to command the "America," was called to his country by the war, thus temporarily stopping the preparations for an execution of the flight.

2nd. Pursuing my purpose—to build an aircraft that will cross the ocean, The America Trans-Oceanic Company was incorporated, and the company, acting for me, has placed an order with the Curtiss Aeroplane Company for a new craft that will have more than ten times the power of the old one. It will be of special design, entirely different from any aircraft heretofore built, and especially adapted for alighting on and arising from rough seas, and, therefore, eminently fitted for the transatlantic flight. It is now under construction and will be tested at the Atlantic Coast Aeronautical Station, at Newport News.

3rd. When completed and accepted, and at the right time, the new "America" will make the attempt to cross the Atlantic, in which project I again venture to ask the co-operation of the Aero Club of America, of your affiliated clubs, and of our own and foreign governments who may be interested in the flight.

I still believe that the first crossing of the ocean will bring quicky in its train aerial liners which will regularly cross in the air from continent to continent, a faith which I expressed in my letter of February 4, 1914, a part of which I quote:

"The science of aviation has made great strides within only a few years. It has conquered many of nature's obstacles, yet it halts at the great ocean, and until one of our great oceans is crossed in a single flight, aviation will not have met the supreme test.

"The crossing of the Atlantic ocean in one flight of an aircraft is, to my mind, as important to aerial navigation as was the voyage of Columbus to transportation by water.

"What man can do once, he can do any number of times. Once the Atlantic is crossed in a single flight of an airship, there will soon follow regular trans-Atlantic trips and a fixed, safe trans-Atlantic passenger air line.

"The crossing of the Atlantic by air is not a matter merely of initiative, nor of daring, nor even of skill; it is a problem of science."

In connection with the above, I still believe that the first crossing of the Atlantic ocean will only mark an epoch in aerial navigation and this faith in its future is another important reason for the existence of The America Trans-Oceanic Company. I hope to see the day when this company will be running aerial liners regularly across the Atlantic and other oceans.

Respectfully,
RODMAN WANAMAKER.

The details of construction of the new huge aircraft ordered by Mr. Wanamaker are not made public, but it is known that the designs have been prepared by Messrs. Glenn H. Curtiss and W. Starling Burgess, who are co-operating with Mr. Wanamaker in this project to provide for the very best that aeronautic engineers, backed by unlimited means, can produce.

It is understood that the design of the new craft is absolutely different from anything else constructed so far, is an entirely new departure in design and construction, and will be the largest aircraft every built. It is also understood that this craft will be equipped with 6 twelve-cylinder motors of 300 h.p. each, or 1,800 h.p., and will be capable of making a speed of about 100 miles an hour, with a crew of six people, the fuel, instruments, provisions and equipment necessary for the trans-Atlantic flight, which it is expected will be made by this craft in about thirty hours.

Mr. Rodman Wanamaker's announcement was received enthusiastically by the aeronautical authorities, all of whom consider it a foregone conclusion that the tremendous progress made in the construction of aircraft and motors, and the fact that scientific instruments have been evolved which make the navigation of aircraft over long distances easy, insure the success of a trans-Atlantic flight with the type of aircraft which Mr. Wanamaker will employ.

Following Mr. Wanamaker's announcements, the Aero Club of America has sent a cable to the Royal Aero Club of Great Britain and to Lord Northcliff, advising of Mr. Wanamaker's project, and inquiring whether the $50,000 prize for a cross-Atlantic flight offered by Lord Northcliff is still open. Lord Northcliff offered the $50,000 prize for the first person making a trans-Atlantic flight on March 31, 1913.

A year before that the Contest Committee of the Aero Club of America was asked to formulate the conditions which should accompany the posting of a prize of $50,000, which it was believed could be secured from Lloyd's of London upon the payment of a reasonable premium, but no suitable agreement could be made at the time, and the prize was not put up.

Lord Northcliff's *Daily Mail* $50,000 prize is to be awarded to the aviator who shall first cross the Atlantic in an aeroplane in flight from any point in the United States, Canada or Newfoundland, to any point in Great Britain or Ireland in 72 consecutive hours. The flight may be made either way across the Atlantic. The competition is open to persons of any nationality holding an aviator's certificate issued by the International Aeronautical Federation and duly entered on the Competitors' Register of the Royal Aero Club. Other conditions for Lord Northcliff's prize are as follows:

ENTRIES—The Entry Form, which must be accompanied by the Entrance Fee of $500, must be sent to the Secretary of the Royal Aero Club, 166 Picadilly, London, W., at least 14 days before the entrant makes his first attempt.

No part of the Entrance Fee is to be received by the *Daily Mail*. All amounts received will be applied towards payment of the expenses of the Royal Aero Club in conducting the competition. Any balance not so expended will be refunded to the competitor.

STARTING PLACE—Competitors must advise the Royal Aero Club of the starting place selected, and should indicate as nearly as possible the proposed landing place.

All starts must be made under the supervision of an official or officials appointed by the Royal Aero Club.

IDENTIFICATION OF AIRCRAFT—Only one aircraft may be used for each attempt. It may be repaired en route. It will be so marked before starting that it can be identified on reaching the other side.

STOPPAGES—Any intermediate stoppages may only be made on the water.

TOWING—Towing is not prohibited.

START AND FINISH—The start may be made from land or water, but in the latter case the competitor must cross the coast line in flight. The time will be taken from the moment of leaving the land or crossing the coast line.

The finish may be made on land or water. The time will be taken at the moment of crossing the coast line in flight or touching land.

If the pilot has at any time to leave the aircraft and board a ship, he must resume his flight from approximately the same point at which he went on board.

Mr. Rodman Wanamaker made his formal entry for the Lord Northcliff prize in July, 1914, when the tests of the first "America" demonstrated the possibilities of that craft to fly across the Atlantic.

It is understood that Lord Northcliff has insured his prize with Lloyd's, but it is not known whether the insurance was to extend indefinitely.

Besides Lord Northcliffe's prize, a large silver trophy has been offered for the first trans-Atlantic flight by Mrs. Victoria Woodhull Martin, of the Woman's Aerial League of Great Britain. With this trophy, Mrs. Martin offered a prize of $5,000.

Among those who expressed their belief that the trans-Atlantic flight will be successful were Alan R. Hawley, President of the Aero Club of America; Henry A. Wise Wood, President of the American Society of Aeronautic Engineers; Elmer A. Sperry, member of the Naval Consulting Board and inventor of the Sperry gyroscope; Henry Woodhouse, Governor of the Aero Club of America, and managing editor of *Flying;* Lawrence B. Sperry, one of the few scientific aeroplane pilots and aeronautic engineers of this country; Raymond B. Price, Vice-President of the United States Rubber Co., who has given long study to the subject; John Hays Hammond, Jr., who has just returned from a trip in Europe, during which he made a special study of naval aeronautics; Professor David Todd, student of aeronautics and who has

studied the meteorologic conditions to be met in a cross-Atlantic flight; Howard Huntington, Secretary of the Aero Club of America, who is an experienced aeronautic engineer, and others.

Mr. Alan R. Hawley's answer to Mr. Wanamaker, which will give the reasons for his belief that the trans-Atlantic flight is possible, will be made pubic later, after it has been transmitted to Mr. Wanamaker.

"We who are close to developments," said Mr. Hawley, "are fully convinced that the cross-Atlantic flight will be successful. All the factors necessary have been ably correlated by Messrs. Wanamaker, Curtiss and Burgess, and given a competent pilot, who can easily be secured, the flight will be a success."

"The success of the first America," said Mr. Woodhouse, referring to the continuous service given by the AMERICA to the British Admiralty, who bought her when the war brought the first project for an Atlantic flight to an end, "has shown that the estimates of what could be done then were pretty accurate. That flying boat has stood many times the rough service which it would have had to stand in a cross-Atlantic flight—and it is still in service. The new project is so substantial in every way as to make the first project appear very modest. When the details are made known, the public will marvel at the thorough consideration given to every aspect of the plan and the progress made in the construction of aircraft, motors and instruments for use in navigating the air. I am especially pleased with this project, as it proposes to employ aircraft for peaceful purposes. There are too many —about 15,000—in use for war purposes."

Mr. Henry A. Wise Wood stated that the advance made in the construction of aircraft has been so rapid that almost anything is possible to-day.

Mr. Lawrence B. Sperry said that from what he knew of the project he could not help feeling enthusiastic over the prospects—so much so that he would be willing to pilot the trans-Atlantic flyer.

Mr. John Hays Hammond, Jr., said that he had to give close consideration to the matter of weight carrying by aircraft in connection with some of his inventions, and had found that there is practically no limit to the weight that can be carried by an aircraft.

Mr. Alan R. Hawley, President of the Aero Club has addressed a letter to Mr. Wanamaker which follows in part:

"My dear Mr. Wanamaker:

"I beg to acknowledge the receipt of your letter of April 1, in which you advise that, pursuing your purpose to build an aircraft that will cross the ocean, the America Trans-Oceanic Company, Incorporated, acting for you, has placed an order with the Curtiss Aeroplane Company for a new craft, ten times more powerful than the first "America," of special design, adapted for alighting on and arising from rough seas, therefore, eminently fitted for the trans-Atlantic flight.

"The Aero Club of America is highly flattered at the proof you have again given of your confidence in its ability to aid in this great undertaking, and begs to assure you of its hearty co-operation and of its desire to assist in every way possible.

"We consider it a privilege to be allowed to assist in carrying to a success this epoch-making project, which opens such wonderful possibilities.

"Aircraft have proven invaluable for war; and the types of aircraft in use to-day, primarily for war, would be suitable, to some extent, for utilitarian purposes, solving difficult problems of transportation in isolated localities, where the run of commerce is slow on account of lack of transportation facilities. Needing neither roads nor rails, nor bridges, only landing places at convenient intervals, the aircraft can render invaluable services in delivering 'express' merchandise, as well as in connection with the Coast Guard Service, for saving life and removing the danger of drifting derelicts at sea, etc.


Mr. Rodman Wanamaker

"As they develop in size, speed and carrying capacity, aircraft becomes related to practically every line of human endeavor, and promise to solve difficult economic and sociologic problems.

"The aircraft you are planning, which, on account of its 1,800 H. P., and size, will be able to cross the Atlantic at a speed of about 100 miles per hour, will, we daresay, begin a new epoch, with possibilities connected therewith unlimited and wonderful.

"To conquer space and time so thoroughly that the ocean becomes but a span, one day's travel, is a wonderful thing indeed. When the Atlantic is crossed by air the world will acknowledge that one event will change the status of things in general. The first year may see only that one flight; the second year may see only five flights, but in the third year the flights may number fifty, and thereafter flying across the Atlantic will be just as common as the flights of squadrons of aeroplanes across the English Channel, which today, seven years after the first flight across the English Channel was made, are considered too common to be reported by the Press.

"When your new trans-Atlantic aircraft is completed and has been demonstrated, it will represent the biggest addition that has ever been made to the military and naval establishments since the invention of the gun, the submarine, and the aircraft itself. It will be the first step towards building the regular fleets of the air, fleets of huge, powerful aircraft, that will be able to cross from the Atlantic to the Pacific and vice versa in such a short time, and thereby provide defense for both of our coasts, at every point, at a fraction of what it now costs to try to defend a small portion of either of our shores. The fact that such a valuable craft can be quickly constructed and can be operated at a fraction of what it costs to operate cruisers, which in some respects are not half as valuable, adds to the value of the large aircraft for doing the work done now by cruisers and for coast defense."

A cablegram was sent to Lord Northcliff, informing him of Mr. Wanamaker's intention to make an effort to cross the Atlantic, and inquiring whether the $50,000 prize for a cross-Atlantic flight is still open. Lord Northcliffe replied as follows: "Yes, after the war."

Mr. Wanamaker's plans do not consider the matter of a prize, and Lord Northcliff's reply will not, therefore, affect the project in any way.

Mr. Alan R. Hawley, President of the Aero Club of America, stated that he did not think that there would be any obstacle in the way of the trans-Atlantic flight on account of the present war.

Philadelphia School of Aviation Chartered.

The Philadelphia School of Aviation has been chartered with a capital of $100,000. Robert Glendenning, of the Aero Club of Pennsylvania, is the principal stockholder.

Aero Club of Illinois Offer Gains Support in Congress

Senator Sherman and Representative Mann of Illinois have announced their willingness to aid the Aero Club of Illinois in bringing a Mid-West United States aviation training station to Chicago. Mr. Mann has informed the club that he will take the matter up with the military committee in the House at the earliest possible moment. The congressman perceives the immediate need for a central training school, and believes that the most accessible point is in the environs of Chicago. Until lately the problem of a suitable field made such a project impossible, but Mr. Charles Dickinson, President of the Aero Club of Illinois, has solved this difficulty by purchasing and donating the use of the land to Congress. The Aero Club of Illinois has received a great number of letters from all over the Middle West from men who are eager to offer their services if such a field is established by Congress.

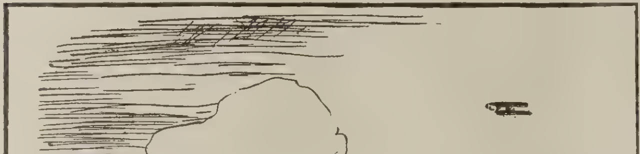
MORE AEROS AND LARGER ENGINES FOR THE MEXICAN CAMPAIGN

IN the developments of the first two weeks in the Mexican campaign nothing stands out with more commanding distinctness than the great utility of the aeroplanes, such as they are, which are in use in this work. Particularly well is this revealed by the use of an aeroplane which reported the exact location of the Villa band with which the first encounter was had.

After massacring 170 Carranza soldiers at Guerrero the bandits were celebrating the "victory" at a point about ten miles south. The news was communicated to Pershing and by him sent to Col. Dodd, who, in turn, sent out scouts by air and land to locate the band.

Late on the evening of March 28 an airman swooped down into the camp with news of Villa's hiding place. Dodd had the call sounded and his men took to the saddle immediately. They did not even know where they were going.

On the way scouts flew back with the news that Villa was



The trail of preparedness.

preparing to march. Dodd did not spare his men. They forced their horses at his command to the utmost and swept on down the river valley, riding at a hot pace.

As he approached the San Geronimo ranch, where the fight actually occurred, he split his division. His men made their way unnoticed through the arroyos, or deep gulches, which cut the foothills in all directions. They were actually in Villa's camp before the alarm was given.

This result would not have been possible without the aid of the aeroplanes.

For the first time, on March 28, aeroplanes succeeded in going the whole way through. Balked by air currents and mountain passes, prior to that date, they were not able to communicate with a certain cavalry column which was pressing Villa in his native district. Those troopers pushed forward so rapidly that General Pershing himself did not know of their exact whereabouts.

For days they were isolated beyond all radio and field telegraph communication; and while headquarters heard rumors from time to time that they were close upon Villa there was no confirmation of this until an aviator of the aero squadron flew to within eighteen miles and returning to Gen. Pershing's headquarters made his report. He announced that Villa's command had defeated the Carranza garrison and had headed south and east with a column of our cavalry close behind.

The many conflicting reports that are reaching the Army headquarters about Villa's wound, his whereabouts, and the probability of his receiving accessions to his ranks from other factions looms up the fact that whether the chase is to be short or long, whether Villa is going south or in some other direction, speculation would quickly give way to actual knowledge if the Army had aeroplanes in abundance. Properly equipped, an aeroplane that can seek out can also destroy, but if there were only scouts in sufficient number the complicated work of locating the bandit's bands would be simplified. Slowly the powers that be are beginning to realize that fact, for arrangements were made on March 30 by Secretary Baker to give General Pershing more aeroplanes as quickly as possible. The purchase of eight biplanes, four each of the Curtiss and Sturtevant types, at a cost of about $80,000, was authorized. Delivery of all within thirty days was specified. They will be the most powerful of the Army's aerial equipment, of 150 horsepower, as compared with the 70 horsepower machines now in use. Rigid efficiency tests will be conducted by a board of aviation officers.

Secretary Baker also indicated that he might accept private offers of aeroplanes to the Government from the Aero Club of America and other civilian aviators. The offer of the Aero Club of America to sell two machines at the nominal price of $1 each, while its patriotism is appreciated, will not be accepted. Mr. Baker said that any private machines accepted would be required to meet the Army's efficiency standards and must be paid for at their actual value.

Furthermore, all the flyers of the air corps have been ordered to return to the border in relays to have their machine refitted with new engines of 100 horsepower, instead of those now in use, and larger and stronger propellers.

One of the aviators expressed the wish for a special type of mountain flying machine, which could be driven to an altitude of 15,000 feet carrying an observer and a military load.

"With such machines," he said, "the circumstances might readily arise in which we could go into the mountains and locate Villa in a very few hours. No aviators can beat our men in skill, but it would require a special type of machine for work at extreme altitudes."

So far as the aviators know, none of them has been shot at in any of their flights. One aviator reported a shot had been fired at him while he was on a hike, doing topographical work after landing with his machine some distance away from the American lines.

One of the aviators, in a daring flight through mountain air and cross currents about March 30, sighted an armed body of 500 supposed Villistas. The aviator was seven hours in freezing cold without alighting. He penetrated to the continental divide, 250 miles beyond here.

Though the main body of the Army suffers mostly from heat the aviators also suffer from the cold. On April 1 two aviators were forced to descend in the mountains twenty-five miles from Casas Grandes in a snowstorm. The aeroplanes were almost in collision 1,500 feet above a precipitous mountain. They passed the night at a Mexican house, where they were treated kindly.

Another of the aviators returning from a very cold flight lost all sense of feeling in his fingers and hands. For two days afterward his fingers tingled. The cold and other endurance tests to which the Aero Squadron has been put does not seem to have impaired the vitality of the fliers or in the least affected their health.

THE NEW CURTISS OX MOTOR

THE Curtiss Aeroplane and Motor Corporation has brought out an improved type of their well-known OX Motor.

The new motor, known as the OX-2, develops more horsepower and has proven unusually reliable after a series of hard tests.

The increase in power is due to the increase in speed obtained by the use of aluminum pistons and improved construction of other moving parts, and to the use of a double carburetor with separate intake pipes and manifold. This construction prevents the difficulties of starving and eddying found in the use of a single carburetor on an eight-cylinder motor.

A heavier and stronger crankshaft and crankcase have been installed for greater reliability. This does not increase the weight of the motor on account of the aluminum pistons and lighter moving parts.

The new crankshaft is made without a flange for the propeller, but with four keys and a taper over which the propeller hub fits and is drawn tight with one large nut on the end of the shaft. This method permits of a much quicker change of propellers, and does away with the necessity of lining it up to insure running true as before.

The reliability of the magneto has been greatly increased by the use of a flexible coupling and longer shaft, instead of the direct drive used formerly. This new drive also adds to the life of the magneto by a great saving in wear and tear from sudden acceleration.

The method of fastening the intake manifolds to the cylinders has been simplified and improved.

The lower end of the intake manifold is water jacketed and hot air stoves have been attached around exhaust pipes to heat all air to carburetor intakes.

A removable oil screen has been put in the oiling system to permit cleaning without dropping the lower half of the crankcase.

Rubber covers over the spark plug porcelains and wire terminals have been added, to prevent shorting at that point, from rain, etc.

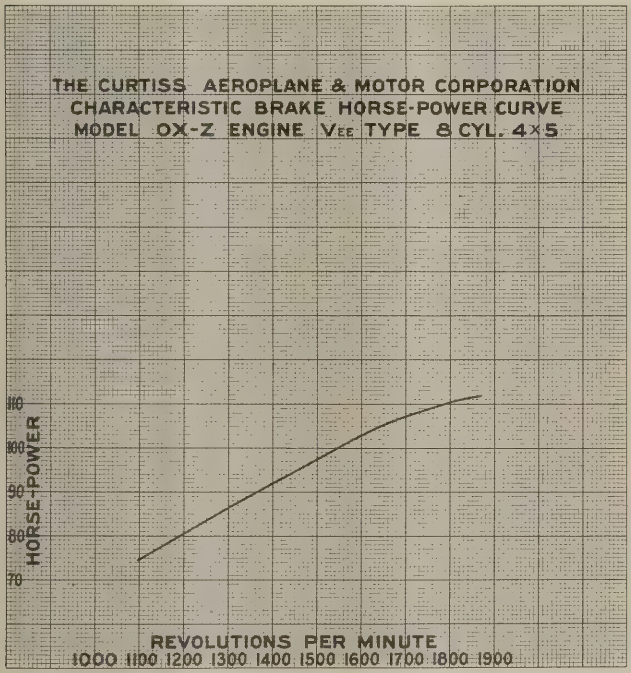
A substantial leather boot now covers the magneto and terminals for the same reason.

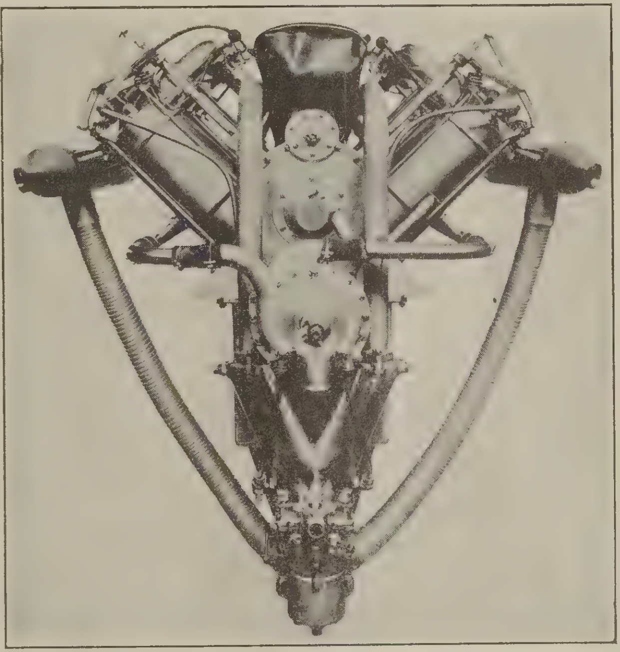
Every nut on the entire motor is now cotter dinned, in addition to the lock washer.

The normal speed of the new motor is 1400 r.p.m., instead of 1,250.

The accompanying chart is compiled from dynamometer tests of a number of these motors and represents the power required of all OX-2 motors before they are passed for shipment.

This new model is now on the market and ready for delivery. The price remains the same as that of the OX model, although motor and equipment are substantially better.





Chicago Activities

Erection of hangars has started on the Aero Club of Illinois' new flying field at Ashbourne. Three have already been spoken for. The Laird Aviation Company, Partridge Aviation Co., and probably Miss Catherine Stinson will occupy the first three.

The Chicago Aero Works has lately shipped a Stupar tractor to Messrs. Callahan and Shank, of Huntington, West Virginia. The company is at present making a light, fifteen-horsepower tractor, and is constructing a special fuselage for Mr. Fred. Hoover, exhibition pilot. A glider was recently sent to Mr. A. S. Abell III., of Baltimore.

The Partridge Co. have already assembled their machines for spring work, and are waiting for suitable weather to carry on school work. Mr. Sinclair, a graduate of this school, will take one of the company's machines to the University of Illinois interscholastics for exhibition work.

Lectures on Aviation Before S. A. E.

Mr. Arthur E. Nealy, of the Aero Club of Illinois and Illinois Model Aero Club, will read a paper on aeronautics to the mid-West Section of the Society of Automobile Engineers at the Chicago Automobile Club. At the annual dinner of the S. A. E. in Detroit, at which Mr. Nealy talked last January, much enthusiasm was found among automobile men regarding the commercial prospects of aviation. The mid-West Section of the organization has taken a live interest in the subject and will hear Mr. Nealy at a technical meeting when racing automobiles and automobile engines form appropriate accompanying lectures.

Wardrop Lectures on Aircraft in War

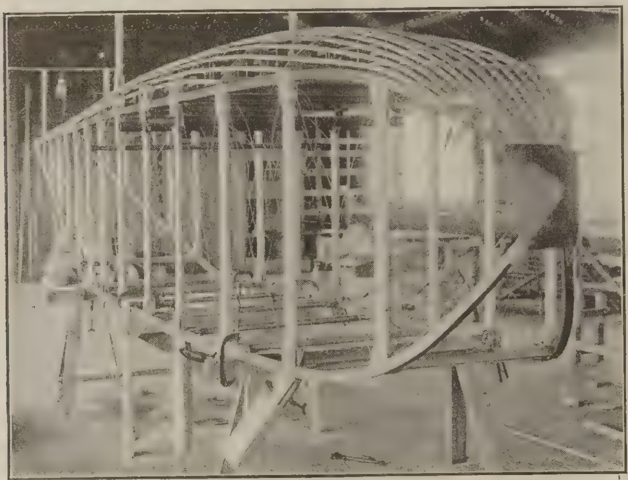
During the last week G. Douglas Wardrop delivered lectures on the important part which aircraft played in the war in Europe before the Harvard Club and Harvard Engineering Society; The Men's Club of the University Heights Presbyterian Church; The Pierce School, Philadelphia, the largest business school in America, and the Aero Club of Pennsylvania. At each and all of the meetings very real interest was evinced in the subject matter of the lecture and in the slides and motion pictures which were presented.

C. E. TRANSCONTINENTAL TRIPLANE

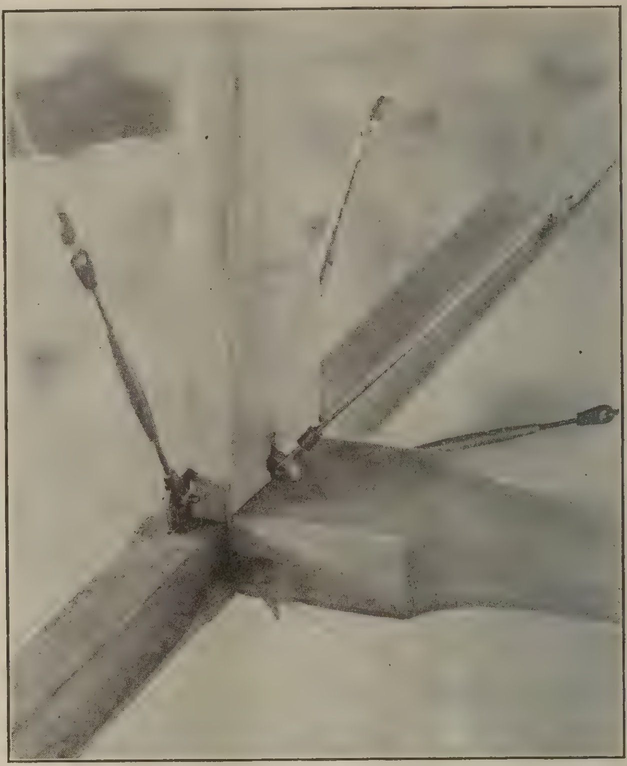
WORK is proceeding very rapidly on the new C. E. Trans-Continental Triplane, at the factory of the company at Anderson, Ind.

As the accompanying photographs indicate, the machine is interesting from the standpoint of refinement of detail as well as from the standpoint of size and flight radius.

The span of the machine is 56 feet and it will have a total surface area of 840 square feet.



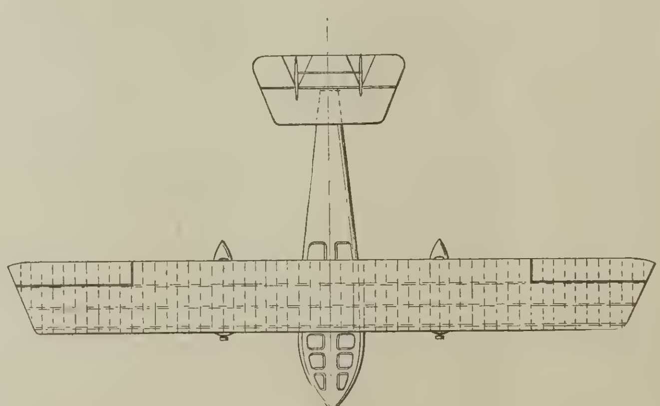
After the first model of this machine has received its air tests, it is the plan of the company to construct further models of this type, substituting steel tubing in place of the usual wooden construction. This type of construction is rapidly finding favor in European countries and will undoubtedly be more general in this country in the near future, because of the fact that it makes possible an interchangeability of the various parts. Contrary to the belief of many people, steel construction can be made as light as wooden construction



and the factor of safety can be made very much higher.

Fuselage.—Reference to the accompanying illustrations will show that the fuselage is of unique design. It is entirely enclosed with a cover of three-ply spruce wood and one

(*Continued on page* 131.)



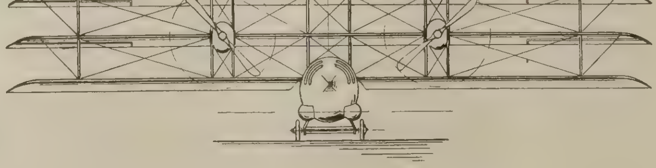
C-E AEROPLANE WORKS	
SPECIFICATION	
TOTAL WEIGHT	2500 Kgs.
WING SURFACE	100 m.²
SURFACE TAIL	4 m.²
SURFACE RUDDER	0,80×2
LIFTING CAPACITY	35 Kgs./m²
CHORD	2 m.
SPAN	18 m
LENGTH	9 m.
CLIMBING CAPACITY	900 FEET /m
RADIUS OF ACTION	15 HOURS
NUMBER OF PASSENGERS	10
MOTORS	2×150 H.P
REVOLUTIONS P.M.	1300
PROPELLERS (Ct. DORAND)	9 FLEE ø P.=8,1 EFF.t.é 81%
SPEED RANGE	48-98
CUB-CAP. OF FLOTTEUR	9 m³ 45
ANGLE OF INCIDENCE	8°
GAUCHISSEMENT	AILERON

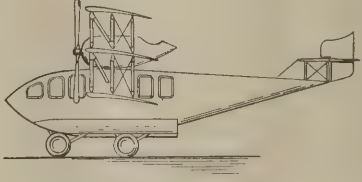
TRANSCONTINENTAL

A-12

TRIPLANE TRACTOR

LAND & WATER MACHINE





SCALE 1 ÷ 100

YALE AERO CORPS HAS FINISHED ITS COURSE

The largest university flying squad in the country is the Yale Aero Corps. At the State Armory in New Haven the members of this corps have just completed a course of instruction in the care and management of a dirigible. Later they will put this knowledge into practical use when the army encampment is held at Tobyhanna, Pa., in the summer.

Some time ago a Yale battalion was formed as a part of the National Guard of Connecticut, but at that time there was no call for volunteers for the aero squadron because it was thought that there might be parental objections to taking up this work.

When, however, the Connecticut Aircraft Company began the construction of the first dirigible for the navy and the airship was set up in the State Armory at New Haven it was seen that here was an unusual opportunity for acquiring useful knowledge, and so a call was issued for volunteers for an aeroplane corps. About forty men responded. A squad of half that number was formed. Among the men who joined the corps were seven who hold pilots' licenses for heavier-than-air machines. One member of the squadron, Cord Meyer, of Great Neck, L. I., has a license to fly in France as well as in this country.

The Yale Aero Corps

For two weeks the men were instructed on the DN-1, as the airship is officially known, under the direction of E. J. Widmer, who was once pilot of a German Zeppelin. They were schooled in general maneuvering, the duties of engineer, of observer and of crew; the handling and care of the airship while on the ground.

The dirigible, which is 175 feet long, now goes to Pensacola, Fla., where it wil be used in the navy training school. Three Annapolis men, F. O. Rogers, of Texas; J. F. W. Gray, of Philadelphia, and R. J. Van Buskirk, of Florida, compose the first crew of the dirigible. They have been in New Haven for some time and accompany the airship south.

The officers of the Yale Aero Squadron are Lieut. Paul F. Slocum, of the Junior Class of the graduate school; Lieut. Paul Schultz, Jr., 1916, of Kenilworth, Ill., and Lieut. M. R. Cary, 1916.

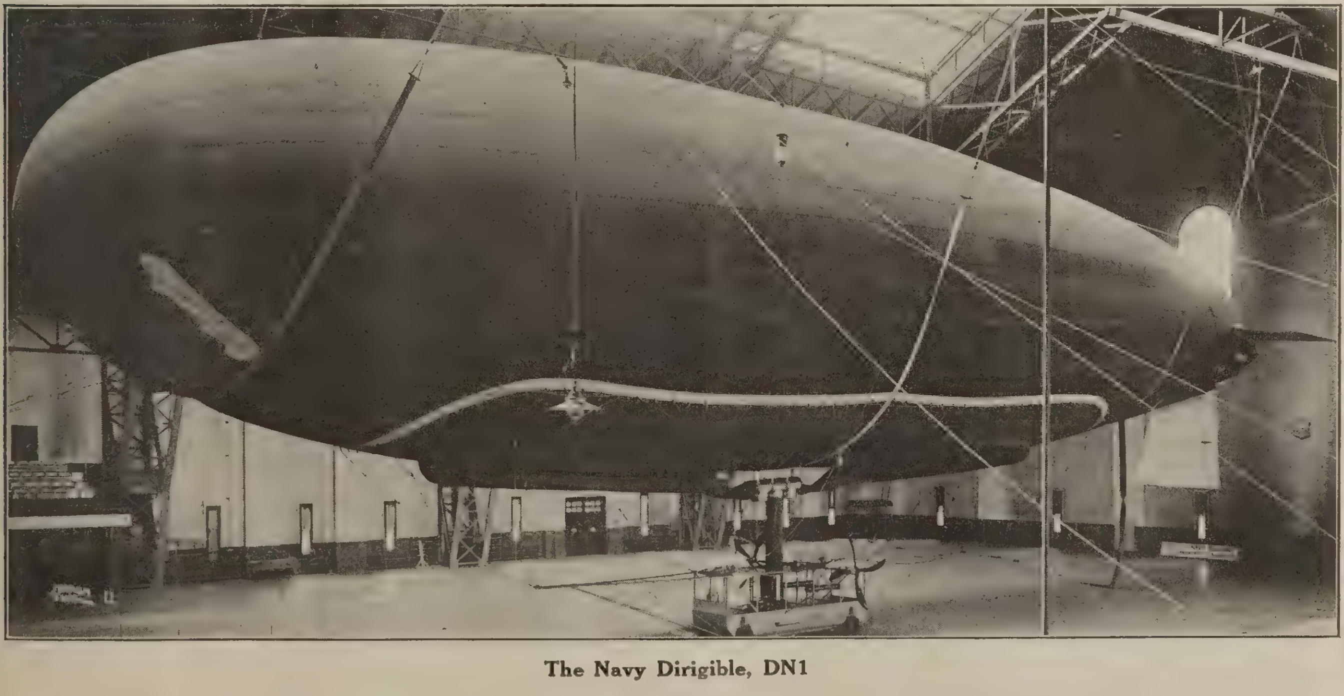
The dirigible is 175 feet long, 35 feet in diameter and 50 feet high. It weighs 5,000 pounds and has a lifting capacity of 2,000 pounds, making a total of 7,000 pounds. The envelope will contain 150,000 cubic feet of hydrogen and the craft will travel at a speed of thirty-five miles an hour.

The car is twenty feet long and five feet wide and will carry a crew of eight. It is built to float on the water. Motive power is provided by an eight-cylinder gasoline engine, which operates two four-bladed propellers, one on each side of the car. The car will be steered by a big canvas rudder hung on the rear of the envelope, while horizontal planes, running on the equator of the envelope, will prevent a rolling motion.

In the front and back ends of the envelope, separated from the main compartment for the lifting hydrogen gas, are two compartments to direct the balloon up and down as it travels through the air. When it is proposed to ascend, the rear compartment is pumped full of air, which makes that end much heavier than the front. The envelope points upward, and is driven by the propellers. When it is desired to descend the operation is reversed, the front of the machine being made heavier than the rear.

A system of pulleys through which the suspending ropes pass keep the car itself at a horizontal position, no matter what the angle of inclination of the envelope may be. A tube rises from the car which is for the purpose of driving air into the two compartments, which are known as balonets.

The two propellers can be rotated by means of a handwheel and worm gear in a vertical plane, so that their line of thrust can be kept parallel to the horizontal axis of the envelope no matter what the angle of inclination of the car.



The Navy Dirigible, DN1

THE FREDERICKSON ENGINES

An aeronautical engine of a new principle has been developed by the World's Motor Company, of Bloomington, Illinois, in 5 and 10 cylinder models, 70 and 140 h.p.

These motors, which are known as the Frederickson engines, are of the two-cycle type insomuch as they produce a power impulse for every cylinder at every revolution, but by means of an oscillating base valve operated by the connecting rod, the owners have developed an engine that, while it embodies the extra power impulse of the two-cycle and the usual simple 2-cycle construction, will largely do away with the difficulties and disadvantages that have, up to this time, prevented this type of motor from becoming anything more than a moderate success.

These motors produce nearly double the horsepower of a four-cycle of the same bore and stroke with proportionate gasoline economy, while their simple construction with the absence of any complicated parts and the resulting reliability render them ideal for aeronautical use.

The operating principle is as follows: Gas from the carburetor or mixer enters the crankcase. There is absolutely no gauge pressure in the crankcase at any time. At the inner dead centre of the piston the valve between the crankcase and inner half of the cylinder is opened. During the outward stroke of the piston, gas from the crankcase is drawn through this valve into the inner half of the cylinder and at the outer dead centre the valve is closed. This valve is operated entirely by the side motion of the connecting rod. There are no gears, eccentrics, chains or cams.

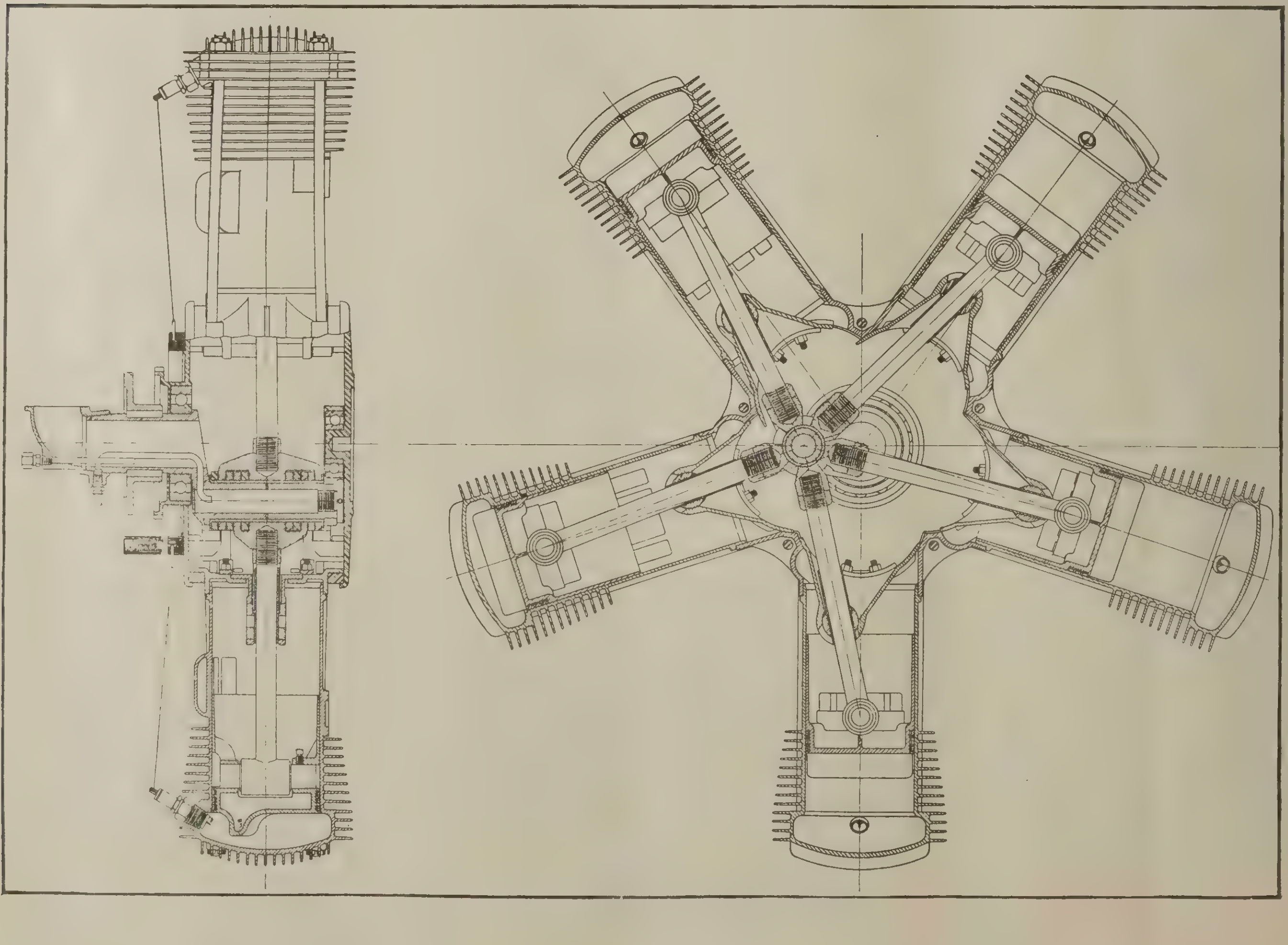
During the inward stroke of the piston, the gas in the inner half of the cylinder is compressed until the piston nears the end of its stroke when this compressed gas is released into the combustion chamber, forcing out the burned gas from the previous explosion through an exhaust valve or port, the opening and closing of which is so arranged that while practically all the burned gas is expelled, all of the unburned is retained. The piston on its outward stroke compresses this gas in the combustion chamber at the same time drawing another charge of gas from the crankcase into the inner half of the cylinder, which in this case forms the primary or low-compression chamber. Near the outer dead center, the gas in the combustion chamber is ignited, forcing the piston toward the center until the expansive force of the gas is exhausted, when it is expelled from the combustion chamber, a fresh charge taken in and the cycle repeated.

The crankcase is made of cast iron with a nickel steel ring shrunk over each end and it contains the seats for the valves which close the inner end of the cylinders.

The cylinders are also made of cast iron with circular cooling fins and a by-pass connecting the inner and outer parts. The port in the outer part for this by-pass is so located that it is closed by the piston, except when the piston is near the inner dead center. The cylinders are supported *from their heads* by nickel steel studs threaded into double nuts under the nickel steel rings which surround the crankcase. Thus, all the revolving parts are supported in a nickel steel frame amply strong to withstand the stresses due to centrifugal force and gas pressure. This construction permits the use of cast iron for the cylinders and valve seats (integral with the crankcase) which material is by far the best for these parts.

Forged steel end plates are bolted on each end of the crankcase by studs extending through both plates. In each of these plates is located one of the crankshaft annular ball bearings. The pistons are of cast iron with three cast iron rings.

The nickel steel connecting rods are of cylindrical cross section, bronze bushed at the top, and at the bottom, are threaded into knuckles in which the crank-pin bearing is placed. The bearing is in the form of a bronze sleeve, free to turn on the crankpin and also in the knuckles. Each knuckle has a pad directly under the connecting rod and at each end of the pad a ring which surrounds the bearing.



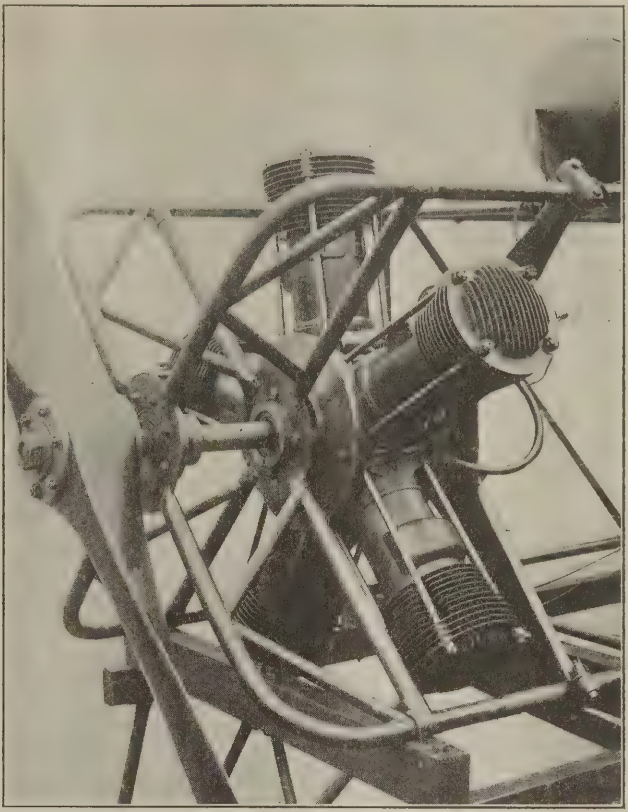
The crankshaft is of nickel steel and hollow. It is of the built-up type, the outer arm being removable. This joint, however, is placed over the bearing so that all twisting stresses are eliminated. One end of the crankshaft is fastened rigidly to the frame in which the motor is mounted. This end also carries the carburetor, gas being admitted to the crankcase through the hollow shaft. An independent shaft is fastened to the front end plate of the crankcase. This shaft runs in bearings in the motor frame and carries the propeller at its outer end.

The cast iron valves are in the shape of a cylinder, or more correctly speaking, in the shape of a segment of a circle—a true oscillating valve. They rock on a curved seat in the crankcase at the base of each cylinder and have an extension projecting into the cylinder. In the end of this extension is a trunnion with a bushed hole through which the connecting rod slides. This side motion of the connecting rod rocks the valve, opening and closing it once each revolution.

Ignition is by means of a single distributor, high-tension magneto, the high-tension current being carried by a single cable to a brush which presses against a circular distributor bolted to the crankcase. This distributor is of fibre with one brass segment per cylinder. From these segments are taken the ignition wires which go direct to the spark plugs, making a simple and very reliable ignition.

The lubricating oil is mixed with the gasoline and an auxiliary force feed oiler, gear driven, is mounted on the frame. This oiler forces jets of oil to the connecting-rod bearing at the crankshaft end, from whence it escapes through the connecting-rod collars into the crankcase.

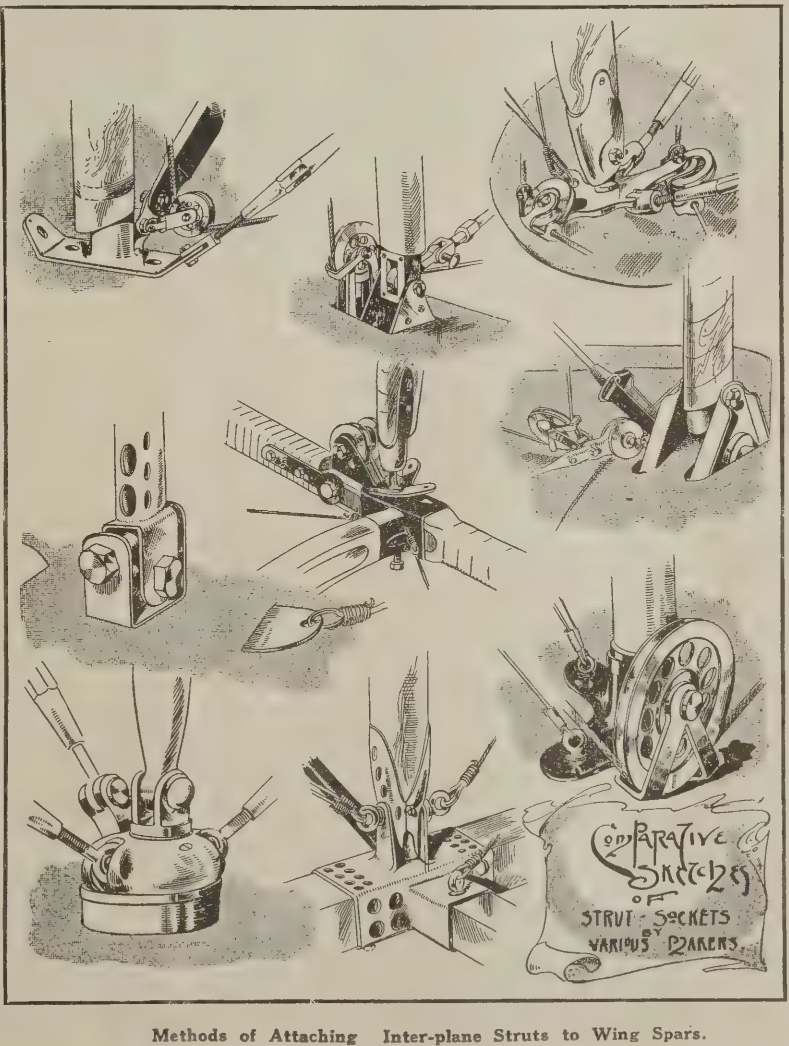
These engines are to be built in several models, in fact, every aeronautical need is to be supplied from the small, light motor for the amateur to a higher-powered single unit than has ever been successful for this purpose.



ATTACHING INTER-PLANE STRUTS TO WING SPARS

THE sketches given herewith illustrating methods of attaching inter-plane struts to wing spars include some fittings that are not of the latest type, but they have been included in order to show the development of this detail of construction.

Starting at the upper left hand corner and reading from left to right, the constructors abroad using the methods herewith illustrated are: Handley Page, Coanda-Bristol, H. Farman, D. F. W., British Caudron, Breguet, Albatros, Hamble River and Graham-White.



Methods of Attaching Inter-plane Struts to Wing Spars.

STURTEVANT GASOLENE GENERATING SETS

THE B. F. Sturtevant Co., of Hyde Park, Mass., are manufacturing portable electric generating sets of a special type that are particularly adapted for use in aeronautical training camp hangars, shops, etc., supplying electricity for lighting and power purposes.

Several of these outfits have been ordered for the advance base marine service in the U. S. Navy. The U. S. Signal Corps Aviation School, located at San Diego, California, is using one of these generating sets with great success.

These sets are intended to be used in direct connection with lighting and power circuits and not through a storage battery although they may be so arranged if desired. Superior design, high-grade workmanship and a particularly efficient governor control insure a constant voltage through wide variations of load.

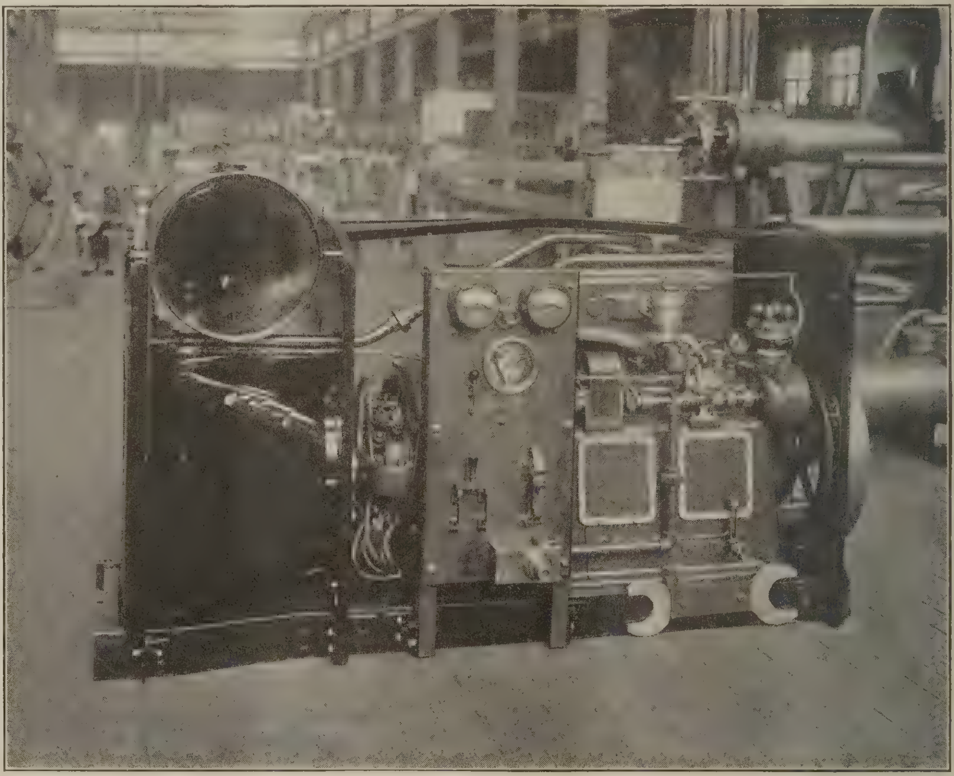
The Sturtevant generating sets were built to supply a demand for an electric generating set that would be easy and inexpensive to operate; one that would not require the service of an experienced engineer in constant attendance and which could easily and readily be transported from one place to another.

Described briefly, the Sturtevant portable electric generating set consists of a Sturtevant direct current electric generator direct connected to a Sturtevant gasoline engine including a switchboard and gasoline tank. A special type of disc fan is mounted on an extension of the generator shaft and arranged to blow air through a cellular type radiator. All of this apparatus is mounted upon two channel irons and the engine generator and switchboard are covered by a sheet metal hood arranged similar to an automobile hood. The engine is of the four-cycle, water-cooled, vertical type with either four or six cylinders, according to the size of the unit.

These sets are built in three sizes, five, ten and fifteen kilowatts' capacity, capable of lighting 200, 400 and 600 twenty-candlepower tungsten lamps. A long-stroke engine has been designed as the most efficient and practical for this service. Both engine and generator are capable of operating under an overload of 25 per cent. for two hours.

Steam engines for the United States Navy Department Marine and other high-grade requirements are used with these gasoline power units.

Honest workmanship, superior design and the reliable and durable construction that characterizes all Sturtevant products are the best guarantees for the Sturtevant gasoline sets.



LEWIS STARTS ON TRANSCONTINENTAL FLIGHT

Birdseye B. Lewis, polo player and sportsman, of New York City, on March 31 began a cross country flight from Coronado Beach to New York City. The start was made without any preliminary publicity, Mr. Lewis merely telling some of his friends that he was going on a pleasure flight. He had been at Coronado Beach about a month playing polo with the winter colony and taking lessons in flying. Though his machine is not regarded by aviators to be suitable for so great an undertaking, and he had a mishap at the very beginning of the flight, Mr. Lewis declares that he will make the trip to the metropolis if it takes until 1920.

Flying at an altitude of 8,000 feet, Mr. Lewis headed for Cajon Pass, in the San Bernardino Mountains. But he lost his way through inexperience in reading his compass, and volplaned to earth shortly before dusk, landing in an irrigation ditch near Beaumont, thirty miles north of Riverside, 125 miles from the starting point. Mr. Lewis was uninjured. The impact, however, smashed the landing gear of the aeroplane. Mr. Lewis then obtained an automobile and rode to Riverside, where he telegraphed to Dayton, Ohio, for the necessary parts to repair the machine.

"I am going to stick around until the sun is shining and the wind is not blowing hard," said Mr. Lewis, after reaching Riverside. "I have got lots of time and intend to take things easily. I expect a lot of trouble crossing the Rockies, but why worry about a thing like that at this stage of the game?"

Mr. Lewis plans to fly by easy stages, going by way of Las Vegas and Salt Lake City, thence following the Union Pacific into Omaha and Kansas City. Other stops will be made at St. Louis, Cincinnati and Buffalo, depending upon the weather conditions and the engine.

Mr. Lewis said that his sole object in making the flight was to stimulate interest among the members of the aviation branch of the National Guard. He is a member of the New York State Aviation Reserves, and at the outbreak of the trouble with Villa telegraphed to the War Department that he was ready to take his machine into Mexico with himself as pilot if more aviators were needed.

Mr. Lewis is the holder of pilot's license No. 345, issued by the Aero Club of America. In attempting to qualify for his expert pilot's license last week he failed because he had to land during a thick fog while returning from a flight to Oceanside.

Mr. Lewis has undertaken the trip with a small Wright 70-horsepower biplane, whereas, experience has shown that a 100-horsepower aeroplane is not equal to combat the treacherous winds encountered in crossing the Rockies.

Mr. Lewis admitted that the going on the first leg of the journey was "pretty rough" and that some one seemed to be "rocking the boat" after the Point Loma Hills at San Diego were lost in the haze.

FOREIGN NEWS

By JAMES E. CLARK

AUSTRIA

Twenty-nine Austrian aeroplanes participated in a raid on Verona and other places in northern Italy on March 27. Five persons were killed in Verona, where eighteen bombs were dropped. Fifty bombs were dropped on Pordenone, in the province of Venice. The raiders attempted to blow up a bridge over the Tagliamento.

One squadron of aircraft dropped bombs over bridges in the Mestro Valley. Of the twenty-nine in the raid, four aeroplanes were brought down and the occupants captured.

Squadrons of Austro-Hungarian naval aeroplanes dropped many bombs on the enemy's batteries at the mouth of the Skobba.

Austrian aviators on March 29 attacked Venice for the seventh time since the beginning of the war. Bombs were dropped on a few buildings and railways.

BALKANS

On March 24 an Allied aeroplane belonging to a squadron which attacked Volovec, west of Lake Doiran, was shot down by Germans after an aerial battle. The machine fell into the lake.

FRANCE

General Pierre Auguste Roques, whose appointment as Minister of War in succession to General Gallieni was announced recently, is best known for his work as Inspector General of Aeronautics. He occupied this post from 1910 to 1912, at a time when the military importance of aviation was beginning to be fully realized. The efficiency shown by this arm of the French service during the war is due in large part to the sound organization built up by General Roques.

The War Office in its bulletin of March 30, says:

"In Champagne our guns brought down a German aeroplane, which fell inside the enemy lines near Sainte Marie-a-Py.

"In the course of the day our aerial forces displayed much activity. In Champagne, in the region of Dontrien, one of our pilots brought down a Fokker, which fell in flames within the enemy lines.

In the region of Verdun five German aeroplanes were brought down in the immediate proximity of our lines. Our aeroplanes were hit many times, but all of our pilots returned safely."

Paris now feels that it is safe from Zeppelin attacks and the French declare that the Germans know it is safer to make a long journey to England than to attempt to drop bombs into Paris. Instead of seeking the protection of darkness as London is doing the French rely on a new type of flying machine which resembles a gigantic silver flying fish. This new type has proved to be very puzzling to the German aviators. It rises from the ground at a third speed, climbing at the rate of hundreds of feet per minute, and the pilot is said to have absolute freedom to fire at any angle.

GERMANY

Lieut. Boelker, of the Aviation Corps, has received from Emperor William the following letter in the Emperor's own handwriting:

"I have been informed that you have again returned successfully from combat with the enemy's aeroplanes. I recently bestowed on you the highest war order, Pour le Merite, in order to demonstrate the importance I attach to the results of your courageous action, but I shall not let pass this moment, when you have disabled your twelfth aeroplane, which means that you disabled two air squadrons of the enemy, without expressing to you again my fullest acknowledgement of your excellent achievement in aerial fighting."

In an aerial fight east of Bapaume, western front, according to an official bulletin issued at Berlin on March 30, Lieut. Immelmann put his twelfth enemy aeroplane out of action. The occupants of the machine, a British biplane, were made prisoners.

Bombs dropped on Metz by the enemy caused the death of one soldier, and other soldiers were injured.

A neutral who arrived in Amsterdam last week from Germany declares that there has been a vast improvement in the Zeppelins which have lately been constructed by Germany and still greater aerial activity may be expected from them in the near future. Presently, he says, the Germans will be able to send three new Zeppelins to the front each week, for the Friedrichshafen plant has increased in size 100 times and the number of men employed has been multiplied by twenty.

The Parseval and the Schutte-Lanz factories are said also to have increased their output at least ten times.

In many German quarters the belief is said to be that aircraft will prove the war's deciding factor.

According to this traveler's account, the newest Zeppelin is much longer and narrower than its predecessors, the latest form having proved more readily manageable in heavy weather. The gondolas hang much deeper than formerly and a bridge connects them. Both gondolas and the bridge are metal-plated, in the hope that they may prove bullet-proof.

Each new Zeppelin carries about ten machines guns and two or three small cannon. Formerly the cannon were mounted on special platforms. It was found, however, that these were often hit, diminishing the craft's efficiency; so as present both machine guns and cannon are inside the gondolas, protected by thick steel plates.

The improved type of airship is built almost entirely of a combination of aluminum and steel, the rudders have been much simplified and the motors are far more powerful than the older ones.

GREAT BRITAIN

The long threatened big aerial attack on England was begun on the night of March 31 when five Zeppeliins of a new type appeared off the southern coast and began a systematic bombardment of various points. This was followed by other Zeppelin raids on the nights of April 1 and April 2. The total number of killed in the three raids was 59 and the total number of injured given in the first reports was 166. The Zeppelins participating in the first attack crossed the coast at different times and took different courses over the eastern counties. One sailed over London. A total of 90 bombs were dropped in different parts of England.

The night was ideal for a foray of this kind but the anti-aircraft defenses worked more effectively than ever before. Some of the Zeppelins were picked up by th searchlights and kept in the glare while they were bombarded by the artillery. One Zeppelin, L-15, was caught in the fire of an anti-aircraft battery on the coast. Its back was broken by a shell and it fluttered along in an effort to reach the continent, but it collapsed in the estuary of the Thames where its crew of seventeen surrendered to a patrol boat and were taken off at 3 A. M. April 1. The boat started to tow the Zeppelin to shore when it broke up and sank. The crew are in the military prison at Chatam Barracks.

There is a strong probability that a second Zeppelin was also brought down. Lieut. Alfred Brandon, a New Zealander who joined the flying corps only last July, distinguished himself during the raid by a daring attack on one of the airships. He mounted to a height of 9,000 feet, got over the Zeppelin and dropped several bombs on it with visible effect. His machine was hit several times by machine gun bullets, yet he returned in safety. Soon after the raid there came an unconfirmed report to the effect that a Danish fishing boat had at a great distance observed what appeared to be a half submerged Zeppelin in the North Sea and many in England believed that this was the result of Lieut. Brandon's work. In the Sunday night invasion the raiders reached the coast of Scotland and killed ten and injured eleven persons.

When the steamship Andaina arrived at Halifax, Nova Scotia, a few days ago the passengers told of having witnessed a thrilling air battle between a fleet of German aerial raiders and a number of British aeroplanes when the Andania was passing Deal, England. One of the German aeroplanes, they said, flew directly over the steamship. The Andania continued on her course, with the opposing fleets still battling in the clouds.

Under date of March 30 the British war office reports that an aeroplane sent out in Belgium had not returned.

Nine days after it had occurred, reluctant admission was wrung from Harold J. Tennant, Parliament Under Secretary for War, that on March 19 six Zeppelins had appeared off the east coast of England at night. He declined, however, to go into the details saying that it was not desirable to say more at this time.

Noel Pemberton-Billing, formerly of the Royal Naval Air Service, who was elected to the House of Commons recently on a platform calling for improvement of the country's aerial fighting forces, declared in the House of Commons last week that a series of casualties with a total of 150 dead, 150 wounded and 105 missing was due to the sending up of British aviators in aeroplanes which were outclassed hopelessly by German machines. Mr. Pemberton-Billing asserted German aeroplanes were immensely superior to British machines.

GREECE

The French war office has issued a statement covering operations along the Greek frontier during March in which it says:

"On the 19th, a Zeppelin threw a few bombs on the Karaburun roadstead, where a number of ships were at anchor. No damage was done.

"On the 20th our artillery shelled enemy encampments near the frontier, and on the 24th the stations at Mrzenti and Gievgeli. The same day a French aerial squadron composed of twenty-three aeroplanes dropped a number of shells on the enemy cantonments at Volovec, west of Lake Doirân. In the course of the operation one of our pilots was hit by a projectile and fell into the lake. Another was forced to land, but managed to reach our lines after having set fire to his aeroplane.

"On March 25 a fight between aFokker and a French aeroplane terminated similarly, the French aviator being forced to land and setting fire to his machine.

"As an offset an albatross was brought down by one of our pilots. The same day one of our aerial squadrons dropped shells on the enemy encampment at Potporitza.

"On the 27th important contingents of British cavalry installed themselves close to our advanced detachments.

"On the 28th Salonika was bombarded by an aeroplane squadron. Twenty Greek civilians were killed and twenty-five wounded.

"Our aeroplanes sent out in pursuit brought down three enemy machines."

Five German aeroplanes bombarded Salonika on March 27. As a result of the raid eighteen civilians were killed and twenty-one wounded, the latter including a Greek official attached to the Finance Department. The Germans lost four aeroplanes, one being brought down near Lake Amotova. A second attempt at bombarding Salonika was made on March 29 by German aeroplanes, but French flyers went up engaged them in battle and compelled them to retreat.

RUSSIA

In the Trembowia district Russian riflemen brought down an enemy aeroplane and made prisoners of the two aviators.

SWITZERLAND

Two aeroplanes of unknown nationality dropped five large bombs at dawn, March 31, on the small Swiss village of Porentruy, near the French frontier. Property was damaged.

TURKEY

British airmen made a highly successful raid on March 24 on the Turkish advance base at Bir-el-Hassanah, 100 miles east of the Suez Canal. They dropped 40 bombs on the Turkish camp, setting it on fire and throwing the inmates of the camp into a panic. Other bombs hit the reservoir and buildings erected by the Turks in the last few months. It has become the practice of British airmen while flying over the desert to attack and disperse the Turkish patrols by spraying them with machine gun fire. During the raid on Bir-el-Hassanah one British airman, experienced in this form of attack, routed single-handed a body of infantry. He approached them from the rear, opened a withering fire with his machine gun, and the entire body broke and fled in all directions. All of the machines participating in the raid returned safely to their base, having flown 200 miles.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

DETROIT AERO RESEARCH AND MODEL CLUB
c/o William P. Dean, 1717 Concord St., Detroit, Mich.

BUFFALO MODEL AERO CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Aero Science Club of America

The meeting of the Aero Science Club of April 3 proved to be very interesting and instructive. Those members and visitors present appreciated the illustrated talk given by Mr. Henry Harrison Suplee on the subject of cementing thin layers of veneer together for various purposes. By the use of a special cement many layers of thin wood or veneer may be cemented together to secure a board of any desired thickness. A special machine, which exerts tremendous power, is used to press these layers closely together. During the pressing the cement is subject to a very great heat and the cement, which is of special composition, becomes exceptionally hard. The pressure, moreover, is so great that the cement while in a liquid state is forced through the pores of the wood, so that when the entire built-up piece is taken out it is practically a solid unit. Photographs and slides were exhibited by Mr. Suplee, showing various products made from this special wood; and also the machinery which is used in manufacturing the wood. A photograph was shown of an automobile now in use that is entirely constructed of wood treated in this manner, with the exception of the motor and such parts that come into immediate operation with the motor, which are, of course, metal.

Mr. Broomfield, treasurer, stated that he had formed a class of young men in the school where he attends. The young men, he stated, were rapidly getting onto the idea of how to construct models and would soon have models ready to be used in the coming contests.

Mr. Cavanagh represented the club at the last meeting of the Franklin School Model Aero Club, Orange, N. J. These young men are also showing improvement and have exhibited models which they have already constructed. This club will likewise be represented in the National Model Aeroplane Competition.

Secretary, Mr. G. A. Cavanagh, 29 West 39th street, New York City.

Illinois Model Aero Club

By A. E. Nealy

At a special meeting of the club, March 31, called by President Hitt, two lectures were given to new members of the club.

Mr. George Weaver, using Mr. Hitt's scale model of the Laird Aviation Company's tractor biplane, demonstrated how an exhibition machine is put together and "taken down." He went through the entire operation, mixing with facts a sprinkling of humorous anecdotes that an aviator meets with when "barnstorming." Next Mr. Arthur E. Nealy talked on "Three Years' Development of Model Motorbases and Propellers"; also for the edification of new members, Mr. Nealy described how model motorbases increased in length, lightness, number of struts and methods of binding. All types of propellers were described. To summarize the talk he explained that models have been perfected in propeller construction and lightness of the entire model. Therefore only two avenues for improvements lay open; propeller run and adjustment and proportionment of surfaces.

Springfield Model Aero Club

By C. H. Munsell

The Springfield Model Aero Club held its twenty-second meeting on Monday evening, March 27. The Chairman of the Contest Committee, Mr. Munsell, read the rules and regulations which that committee has adopted for governing all official club contests during the coming year. Two very interesting speeches were delivered at this meeting. One of the members, Mr. Dowd, gave a very interesting exposition explaining the theory of the Dunne inherently stable aeroplane. Mr. Dowd, who has given the subject very extensive study, illustrated his lecture with diagrams and practical demonstrations with a model Dunne glider. Mr. Cushman, another member, gave a topic concerning a recently invented range-finder for ascertaining the distance of an approaching aircraft. A general discussion of current topics followed the speeches of the evening. The club is now established on a firm basis, and, with an ever-increasing membership, expects to do some good work in the National Competition. Mr. Charles H. Munsell, Secretary, 47 Churchill street, Springfield, Mass.

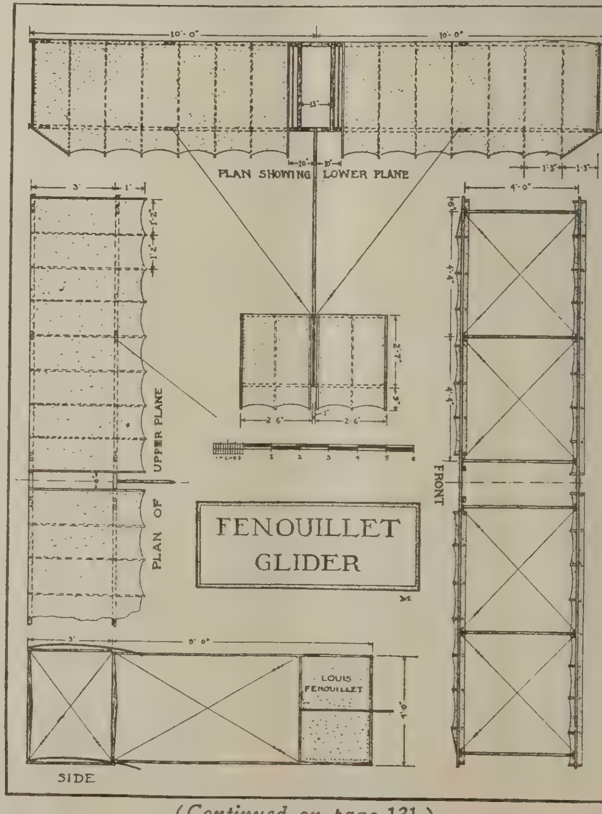
The Franklin School Model Aero Club

By Clarence Maguire

On Thursday, March 30, the Franklin School M. A. C. held its third meeting. Some of the members exhibited models which they constructed during the past few weeks. The models were fairly well constructed, considering the short time these members have been experimenting, and there is no doubt but that the members will have a number of good models ready for the coming contests. Every spare moment is being utilized and the indications are that a good team can be selected to take part in the early contests. Mr. G. A. Cavanagh represented the Aero Science Club at this meeting. Mr. Clarence Maguire, Secretary, Y. M. C. A. Building, Orange, N. J.

The Fenouillet Glider

The glider described and shown in the accompanying drawing was constructed and flown by Louis A. Fenouillet, a member of the Aero Science Club and who is now successfully piloting one of the National Guard Gallaudet machines at



(Continued on page 131.)

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

His Prescription

"She says I am dull," said the pilot, speaking of his lover to his friend.

"Well," said the friend, "you should crack a few jokes occasionally. Ask her to marry you, or something like that."

An Akron, Ohio, man had two wives in the same home.

That's all right. We have to economize during these hard times.

Poor Fellow

Sick Aeronaut—It doesn't make much difference whether I die now or not.

Doctor—Why, my good man, why not?

Sick Aeronaut—Well, I must owe you several hundred dollars by now, and I'll be in the hole, anyway.

"I'm sorry you don't admire Mr. Gumpins, the balloonist," said the tactful woman. "His ancestors were very distinguished and estimable people."

"Yes," replied Miss Cayenne. "What a misfortune for his family that so many of them died."

"What do you think of these cigars?" asked the proprietor of the Tote Fair store at Petunia.

"Well, they're not much for smoking," replied the aviator's mechanic who just came to town, "but I reckon if they were stewed they would make pretty fair catnip tea."

"I don't see how Adele could possibly stop to get married. She has such a passion for travel."

"But she did it to save time?"

"How's that?"

"She married an air pilot who was formerly a shipping clerk, and now he packs all her trunks for her."

An aviator hit his wife in the eye with a shoe as she tried, for the ninth time, to awaken him. The judge ordered him to get an alarm clock.

Poor judgment, judge. Don't you know that an alarm clock in the eye is more painful than a shoe?"

Aeroplanist—Madam, I am sorry that I killed your dog. May I replace him?

Spinster—This is so sudden.

"I dined at my fiancee's home today," said the flying sportsman.

"No doubt they regard you as one of the family by now, don't they?"

"Not yet. They haven't reached the point where they bawl me out if I make a spot on the tablecloth."

"Papa," said the aviator's son, "what is a pacifist?"

"Any man, my boy, who makes war on the future of his country."

First Mechanic—And we camped in the shadow of the pyramids; they were simply covered with hieroglyphics.

Second Mechanic—Good Lord, did any of the dirty things get on yuh?

Aeroplanes that won't fly, submarines that stay down—we've got to learn Efficiency, or teach the world "American" methods.—*Evening Mail.*

No Chance

When an aviator is figuring on just where to drop a bomb, and the folks down below are figuring just where to hide to escape the bomb, nobody gives heed to what the bomb is figuring.—*San Francisco Examiner.*

Britain means to be as thorough and as exasperating as she can in the matter of the blockade. The latest addition to her contraband list is sausage skins. Perhaps afraid they might be blown up and used for Zeppelins.

"Drat this rise in the price of gasoline!" said the poet.

"What difference does it make to you—you don't own a flying machine.

"Ah, my friend, you don't understand. When gasoline was seventeen it was at the rhyming price, but what can a self-respecting muse do with eighteen and a half?"

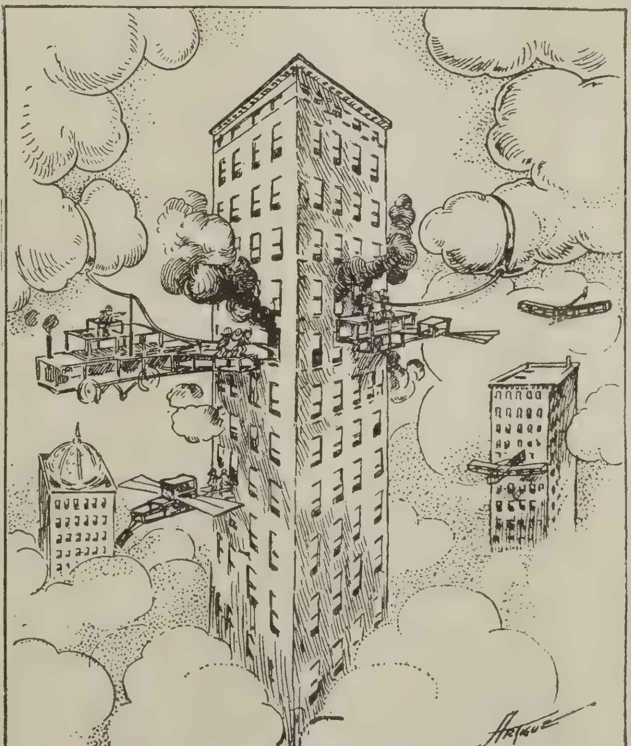
The aviator was waiting for a train.

He walked up and down the platform humming to himself.

Voice (from among the milk cans)—What do you think you're doing?

Tuneful One—Oh, just singing to kill time.

Voice—You have a fine weapon.



FIRE-FIGHTING, 1920.

The First Flight Across the Isthmus of Panama

In substantiation of his claim that he was the first aviator to fly across the Isthmus of Panama, Robert G. Fowler, of the L. W. F. Engineering Co., of Long Island City, N. Y., directs attention to the issue of the *Canal Record* of April 30, 1913, from which the following is taken: "Mr. Robert G. Fowler, the aviator, accompanied by Mr. R. A. Duhem, of the Duhem & Harter Motion Picture Co., of San Francisco, Cal., made the air voyage from the Pacific to the Atlantic entrance of the Canal on Sunday, April 27. This is said to be the first ocean to ocean flight ever made in a single trip and it is the first time that a flying machine has crossed the Canal Zone from ocean to ocean." As the *Canal Record* is the official paper of the Isthmian Canal Commission, published in Acon, Canal Zone, Mr. Fowler is of the opinion that this testimony should establish his claim for precedence in making the first flight across the Isthmus.

Concerning his 1911 trip across the Continent, Mr. Fowler says that he made the entire trip from ocean to ocean with the same plane with which he started and to date he is "the only pilot to accomplish the trip with one plane and the only living pilot who has made the journey."

(*Continued from page* 110)

had been unable to provide same on account of the lack of funds and inability to get aeroplanes from either the Army or Navy Department.:

(d) *The Coast Guard Aerial Corps.* A project to establish a system of aerial coast defense was evolved last year, from plans proposed by Captain V. E. Clark, of the U. S. Army Aero Corps; John Hays Hammond, Jr.; Rear Admiral Robert E. Peary, and others. The Aero Club of America and its 27 affiliated aero clubs adopted the project and offered their co-operation and support to develop the plan. The Chamber of Commerce of Portland, Maine, promptly took steps to establish the first station.

President Wilson, Secretary Garrison and Secretary Daniels approved the plan, which is, essentially, to establish a chain of Aero Coast Patrol stations along the Atlantic Coast and the Pacific Coast and on the Great Lakes, at intervals of 100 miles from each other; stations to be established also in the interior, so as to interconnect the East to the West, the North to the South, every Coast Guard and Militia station being an Aerial Patrol Station. In case of danger a station on one of the seaboards can instantly advise the entire country of the impending danger.

The idea was promptly adopted and ten such stations will be established in different States in the near future.

"We have just considered H. R. 13830, which aims to create the Coast Guard Aerial Corps, "for the purpose of saving life and property at sea, contiguous to the coasts of the United States, and for national defense, to be operated as a component part of and by the personnel of the United States Coast Guard." This is a valuable measure, especially invaluable as, while adding efficiency to the Coast Guard, it provides a reserve of trained men for the purpose of national defense. We cannot commend this bill too highly.

(e) *Postal Aeroplane Service.* The Post Office has advertised for bids for carrying mail over seven routes in Alaska and one route in Massachusetts. This has created much interest and there are people willing to pay the deficits that would surely accrue from the first experiment of this kind. But men of exclusive ability and knowledge of aeronautics are in demand for large manufacturing enterprises, and it may not be possible to advance this project much this year—although it is considered as most important by the aeronautical movement.

(f) *Aero Clubs and Private Aeronautical Organizations.* There are about thirty aero clubs and aeronautical societies. Most of these were organized in the early days when aeronautics was only an expensive hobby and are absolutely free from commercialism. In most cases the governing rule is that men interested in manufacturing or selling of aeronautical equipment cannot be officers of the organizations. These clubs and societies will gladly co-operate with the Government in any way in which they can be of assistance.

(g) *American Aeronautic Industry.* The aeronautic industry is growing substantial. Large orders for aeroplanes and aero motors placed in this country, which probably aggregate over $25,000,000, have built up an aeronautical industry which promises to soon become second to none. There are already half a dozen large aeroplane and motor manufacturers who are producing aeroplanes and aero motors as efficient in every way as the best European products. A score of other firms are preparing to do likewise.

American seaplanes, as a matter of fact, are superior to European seaplanes, there being no seaplanes in Europe

capable of carrying upwards of 1,500 lbs. of useful load, as American seaplanes are carrying. About two hundred seaplanes having power plants ranging between 200 h.p. and 320 h.p. have been delivered in European countries.

American manufacturers have solved, one by one, and most successfully, the problems of getting suitable material for manufaturing efficient aeroplanes and motors. Half a dozen new, substantial concerns have entered the field in the past few months, and will soon be ready to add to the facilities for manufacturing aeroplanes and motors.

(h) *Aeronautics in Universities and Colleges.* Only the Massachusetts Institute of Technology, the University of Michigan, and the Pittsburgh University have taken up aeronautics so far, but other institutions will soon follow. Aeronautics is developing in rapid strides and parents who send their sons to college to fit them for active life are beginning to realize that aeronautics will afford stupendous possibilities for their sons.

Through the tremendous strides forward of aeronautics there are wonderful possibilities for the employment of ingenuity, genius and skill, and business opportunities greater than have ever been created by progress in any one line of human endeavor.

Problems of engineering as huge as were solved by Goethals, McAdoo, and other master builders; judicial and legal questions to be decided as stupendously difficult as any Gladstone would wish them; possibilities for the development of international relations greater than were ever conceived; problems of transportation to be solved by the application of aircraft, as wonderful as any economist could wish; opportunities to gain distinction splendid enough to satisfy the most ambitious person.

It is to some extent the inability to get instructors in aeronautics that has prevented educational institutions from establishing a course in aeronautics. The Massachusetts Institute of Technology was enabled to start its course by the Navy Department, which assigned Lieut. Jerome C. Hunsaker to that institution. It is possible that the Department of Aeronautics would supply instruction of aeronautics to educational institutions.

We would suggest that you add to the bill, if possible, a provision for licensing and registering of aviators by the Department of Aeronautics, so it would not be necessary to have a State license as required for automobiles.

The Aero Club of America, as the sole representative of the International Aeronautical Federation in America, issues certificates to aviators under conditions regulated by the Federation, which certificates are considered as certificates of qualification and are recognized by the governments of the eighteen countries represented in the Federation. Only persons holding a pilot certificate of the Federation may compete in aeronautical events and establish international records.

The license to be issued by the Department of Aeronautics would, of course, not take the place of the international certificate for sporting events, but would permit aviators to cross State lines without State interference.

In urging that this be done, we have in mind that if it is not done, some of the States may do as the State of Massachusetts did. This State passed a law providing for State licensing of aviators. Unfortunately the cost of having experts to put aviators through their tests was beyond the State Treasury's resources, and the law could not be made operative in that respect; although it is operative to the extent that an aviator has been fined for not having taken the State license which he applied for, but could not be given to him because there were no experts to put him through the tests.

What is needed is a system of Federal licensing which will enable aviators to fly across the continent with the least inconvenience. A sportsman, Mr. Blakeman B. Lewis, has started from Coronado, California, for a flight across the continent. In a few years such trips will be common and will be made in between twenty-five and forty hours. If State registration were necessary, it would take longer to register than to cross the continent.

Registration of aircraft is recommended as an important measure. There have been reports of late of strange aeroplanes which have been seen flying near large munition plants. Had we a system of registration, all aircraft would be under Federal control.

Again commending you for your valuable measure, and assuring you of the hearty support of the Aero Club of America and the affiliated Aero Clubs, we remain

Sincerely yours,

For the Executive Committee of The Aero Club of America,

ALAN R. HAWLEY,
President.
HENRY WOODHOUSE,
Governor.

G. DOUGLAS WARDROP
Managing Editor

RALPH E. DeCASTRO
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Baker Talks

AT date of writing we are unable to verify the correctness of the press statements given below. If Secretary Baker made the statements included in the last paragraphs, he is misinformed. The amount that he asks for aeronautics is again not sufficient to form even the skeleton of an aeronautical organization for the Army. When our Military aviators are supplied with three aeroplanes each it will be found that the amount Secretary Baker asks will not go very far, and that in the case of trouble he will again be with an air corps utterly insufficient. We have not seen any signs of realization on the part of the authorities of the fact that at least six aviation schools must be established for the training of Army aviators and Militia aviators. The cost of establishing any of these schools will be far above the amount Mr. Baker asks for the entire air service.

Mr. Baker's criticisms of American aeroplanes is absurd. As a business Mr. Baker must realize that criticism must always be based on knowledge of conditions. Criticism based on hearsay is unjustifiable. When he criticises American machines and American motors for not doing what European machines and European motors are doing, he is comparing the work of a few American aeroplanes against the work of thousands of European machines. He does not seem to know that in Europe all military aviators are supplied with three aeroplanes each, and as soon as an aeroplane or motor shows the least defect the pilot is promptly supplied with another machine or another motor so that he is not troubled with preparing his equipment as are our aviators.

Regarding Secretary Baker's statement that there are fifty-nine aeroplanes owned by the Army, we are surprised that Mr. Baker can be so gullied as to believe such a thing when the Mexican war has shown that we had just a little over one-tenth that number of aeroplanes in commission. Mr. Baker has undoubtedly counted the ghosts of past aeroplanes, which passed away long ago. Unfortunately ghosts are not available for service. And perhaps the Secretary also included the Langley aerodrome, now housed in the Smithsonian Institution, and only of interest historically.

The press despatches follow:

WASHINGTON, April 8.—The Secretary of War, Newton D. Baker, made his first appearance before the House Committee on Military Affairs today in connection with estimates for the Army Appropriation bill. He discussed Army matters with the familiarity of one who had had much experience, one of his most important announcements being that there is to be a reorganization of the Aviation Corps.

This reorganization, the Secretary said, would be by "addition if not subtraction." Secretary Baker said he was giving serious consideration to the organization of the Aviation Corps independently of the Signal Corps. Army aviators are now under the Signal Corps. The Secretary intimated that the recall of Lieut. Col. George O. Squier, who has been an official observer on European battlefields, was preliminary to placing that officer in charge of Army aeronautics.

Secretary Baker told the House Committee that competition among private manufacturers was a good thing, and it was not deemed essential that the Government shall make its own machines. There was no threat of a monopoly, he said.

In detailing the operations of aeroplanes on the Mexican border and the difficulty encountered, Secretary Baker answered a question as to whether "aeroplanes are really useful there."

"Yes, we are relying on the aeroplanes entirely for communication with the front," said the Secretary. "We cannot use the wireless sets at all in the daytime in Mexico because of the bad static conditions, and only irregularly at night. There is a very profound disturbance of the electric field by the large bodies of iron ore there.

"All our aeroplanes are biplanes. These engines have approximately 90 horsepower and should have 140 or 150. Engine development is the great trouble with aeroplanes. Our trouble is in not getting over the high mountains in Mexico."

Secretary Baker admitted that some of the friction in the aviation service is due to the fact that the fliers are supervised by officers who are not practical airmen. He defended the skill of Army airmen, and said that he had determined to put the aviation service under better supervision than it has had heretofore.

"I have decided," he said, "to reorganize the entire aviation section and put it under better supervision. Our aviators are wonderfully brave, and hold an amazing number of records, not only of this country, but the world. We will reorganize the service under a new set of rules, and we will have in the supervision work the services of Colonel Squier, returning from Europe."

Secretary Baker also announced the approaching appointment of a board to test aeroplanes, including the eight to be purchased under a recent act of Congress. This board will consist of Captain Virginius Clark, Lieutenant T. De Witt Milling, and Lieutenant Byron T. Jones.

Admitting that at one time during the present Mexican expedition only two of the eight aeroplanes sent south of the border were in serviceable condition, Secretary Baker said that at the present time all but two of the number were doing duty. He said that at no time were the difficulties serious, but he explained that the high altitudes at which the machines must fly over the Mexican mountains affect the exhaust.

Secretary Baker told the committee that the United States Army had no armored aeroplanes, because they are not intended for use in making attacks. They are being used solely for scouting purposes. Secretary Baker said that a machine flying at a height of 7,000 feet was safe from rifle and small gun fire, and that the war in Europe had demon-

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

strated the fact that an aeroplane was safe from anti-aircraft guns when flying at 14,000 feet.

Secretary Baker explained to the committee that the European censorship was so rigid that even the official observers representing the American Government had been unable to supply the War Department with information concerning the wonderful development of aeroplanes abroad. He said that the aeroplanes being bought in this country by the belligerent nations were used abroad only for practice and instruction.

The Secretary asked for $1,785,000 for the Signal Service, mainly for regular Army and National Guard aviation purposes. There is about $600,000 available under previous appropriations, and the Secretary expects to buy thirty-two new machines. He said the fifty-nine aeroplanes now owned by the Army are underpowered.

Asks $50,000 for New York Air Squads

THE Aero Club of America has appealed to Governor Whitman and Senator Henry Sage, chairman of the Finance Committee of the State Senate, urging that an appropriation of $50,000 be made to further the work of the two aero companies of the New York National Guard, one of which is stationed in Buffalo and the other here.

"The two aero companies of the New York National Guard," the telegram read, "are asking for very moderate appropriations in connection with the highly important work they are doing. Under ordinary circumstances $100,000 would be needed to bring these two companies into existence, but owing to the unpaid efforts of a number of able men, together with private subscriptions, this vitally important department of our military organization can be brought into existence at an expense to the State far below its true value.

"We strongly recommend that you urge the Finance Committee to add to the appropriation $50,000, to take immediate advantage of the opportunities."

To Get Aeroplanes to the Border

A COMMITTEE of the Aero Club, of America has investigated the possibilities of getting twenty-four aeroplanes to the Mexican border in the near future, to equip each of the aviators of the U. S. Army Aero Squadron with three aeroplanes, which is the proportion of aeroplanes allowed for each aviator in Europe, and reports the following conditions, which it submits for public consideration:

"The Army authorities are afraid to order twenty-four aeroplanes at present, to equip each of the aviators of the squadron which is in Mexico with three machines. They have not taken steps as yet to form and equip an additional aero squadron. They fear that if they order the number of aeroplanes absolutely necessary to have ready to meet an emergency, they may, if the Mexican campaign should end before June 30, when the regular appropriation will be made available, be criticized for spending the appropriation on machines available, at present, which are suitable for the Mexican campaign, instead of waiting to secure a better type of aeroplane that may be developed in the meantime.

"On the other hand, they know that if they do not order the aeroplanes and the worst happens in Mexico, they will be condemned most severely for not providing to the limit of the means at their disposal.

"The Aero Club of America believes that the American public would sooner spend a hundred times the amount involved than to deprive the Mexican expedition of the effective and protective aeroplanes. It is willing, in fact, if necessary to invite public subscriptions to a fund to pay for these aeroplanes, same as it did in connection with the training of Militia officers and civilian aviators, to organize a reserve of trained aviators to have ready to meet an emergency. But it does not consider that necessary, believing that the public will not criticize the authorities for ordering twenty-four aeroplanes immediately, instead of waiting until the eight aeroplanes ordered have been put out of commission."

Another Patriotic Offer

TO enable the Militia of ten different States which are anxious to form aviation sections to give a course in aviation to one of their officers, Mr. John E. Sloane, president of the Sloane Manufacturing Company, of Plainfield, N. J., and son-in-law of Mr. Thomas A. Edison, has offered to train an officer of the Militia of each of ten States, free of charge.

Mr. Sloane, who has been interested in aeronautics for a number of years, is arranging to open a large well-equipped aviation school at Sheepshead Bay Speedway in addition to his present school at Garden City. Students will first be taught on the slow military machine, and then on the Sloane military biplane, which recently, when tested by the British Admiralty, climbed 3,000 feet in seven minutes and twenty-seven seconds, and made a speed of over eighty-four miles an hour.

Mr. Sloane's generous offer was very much appreciated by the executive board of the Aero Club of America, which has charge of the work of forming an aviation reserve composed of civilian aviators and officers of the Militia of different States. Since Villa's raid on Columbus brought out the fact that the United States Army had only eight low-powered aeroplanes in commission and eleven aviators available, the club has been training aviators and Militia officers, keeping them in training for any emergency. There are at present officers from twenty-two States and a dozen civilian aviators under training at Newport News at the Curtiss School of Aviation and Mr. Sloane's offer affords facilities for immediately training ten additional officers.

To enable the Militia of the different States to take advantage of Mr. Sloane's offer, the personal expenses of the officers of those States which have no funds for this purpose will be paid out of the National Aeroplane Fund of the Aero Club of America.

Mexican Campaign Conclusive Argument Against Government Manufacturing of Aircraft

BUT for the $25,000,000 worth of aeroplane business placed in this country aeroplane constructors would still be at that stage where they could only build a few aeroplanes per month, and would not be able to supply aeroplanes on short order for the Mexican campaign.

The unpreparedness, low-powered machines, insufficient equipment, shows the lack of knowledge or ability and gives an example of what the standard in a government aircraft factory might be.

There is no truth in the assertions made that American motors are not equal to foreign motors—the truth is that foreign countries protect themselves against possible motor trouble by equipping raiding aeroplanes with two motors and by keeping a good stock of motors on hand to take the place of motors that fail.

Aerial Mastery

LET us go to the limit on our virtually blank sheet while we are beginning this necessary defensive preparation job.

Let us awake, let us amend by grasping the present chance to take the newest leadership.

Let us assay not rivalry of Britain's long established supremacy at sea but the coming aerial mastery.

For just now we can do that.

This is true because at this new game American economic superiority can cut in at the head of the procession and find itself nearly on the same time footing with army and navy burdened Europe in first reaching the goal of overhead dominance announced only some weeks since as the aim of the Allies.

Swift part taken by undebated private enterprise and local movement is one of the most gratifying features of the happy occasion for the comment presented in the American Aero Club's timely and practical backing of the Peary project to put an air guard station every hundred miles along the coast.

Portland's inaugural subscription of substantial thousands will be followed quickly by the prompt action of other ports and it is likely this most promising line of approach to solution of the defense problem will be carried to a workable conclusion while Congress is deliberately discussing provision of a third rate naval equipment to be ready when babies born to-day can vote. This movement will go with a rush.

Give it a big boom.

The News of the Week

New American Altitude Record

Steve MacGordon, an instructor in the Curtiss Aviation School at Newport News, established a new American altitude record for an aeroplane carrying a passenger when he ascended to a height of 14,800 feet on April 8. He was accompanied by W. A. Hudson, of Toronto, Canada, a student. The flight was made in a Curtiss military tractor biplane.

Until to-day the passenger-carrying altitude record was held by Lieutenant J. E. Carberry, U. S. A., who on January 5, 1915, attained a height of 11,690 feet in a flight at San Diego, Cal. The world's record is held by H. Bieran, an Austrian aviator, who flew to an altitude of 6,170 meters (20,243 feet) on June 27, 1914.

This flight is the second American record flight MacGordon has made this month. On April 1 he set a new record for cross country flight, carrying one passenger, when he flew from Newport News to Washington and return, a distance of more than three hundred miles, without stopping his engine. He has announced his intention of "going after" the world's altitude record when the weather becomes warmer.

Twenty-four Aeros for the Army

The Army Appropriation bill which passed Congress on March 28 provided for 24 additional aeroplanes. Secretary of War Baker issued this statement concerning this equipment:

"There is no present intention of buying 24 machines. The first thing will be to buy eight machines and experiment with them to get the best type we can of those that have been developed for European service. General Funston thinks that he should have eight machines in addition to those he has now. They will be used on scout duty and will not be used for offensive operations except incidentally.

"We do not know what is going to happen in Mexico, and we have no idea how many columns we may have to divide our forces into. It may very well be that before we get very far with these eight machines we have and the eight we propose to get, some of them will be wrecked.

"The ultimate intention is to build up two squadrons, so organized as to be types for service conditions, so that when we do actually have service use of aeroplanes we will not have to reorganize the signal service."

Large Aeroplane Under Construction in California

Mr. W. G. Loomis, Manager of the Andermat Aeroplane Co., at Sunnyvale, Cal., announces that his company has almost completed the construction of a large sized aeroplane. The dimensions of the cruiser give it a wing-spread of 72 feet and a length of 40 feet from nose to tip of the tail and it will be propelled by two Andermat twin-four V-shaped engines which develop 120 h.p. and it is expected that while in the air this new cruiser will have a carrying capacity of 2,275 pounds.

Guard Aviators to Study at Columbia

Under the direction of Prof. C. E. Lucke and Prof. F. O. Willhofft, Columbia University, New York City, is organizing a course in the engineering of aeronautics for the aviation corps of the New York National Guard. Although the course is not regularly in the curriculum, it will be accepted by the National Guard for advancement in the service.

Raynal C. Bolling, counsel of the United States Steel Corporation, is a prime mover in the establishment of the class, which will include twelve members of the aviation corps of the Guard. It will meet for a two hour session every Friday night under Professors Lucke and Willhofft and every technical detail of the aeroplane engine will be studied. It is planned to have an additional class for the Naval Militia.

Most of the members of the class have been making trial flights in the National Guard service machine at Hempstead.

New Cross-country Record Made by Curtiss Machine

A new American cross-country flying record was established on Saturday, April 1, by Stephenson MacGordon, a Curtiss pilot, by flying from Newport News, Va., to Washington, D. C., and return, without alighting. The distance covered is estimated at 300 miles. MacGordon carried a passenger and made the flight in four hours and forty-five minutes.

The machine used was a Model R-2 Curtiss Military tractor aeroplane, equipped with a Model V-2 Curtiss motor rated at 160 horsepower. MacGordon left Newport News at 10:35 A. M., and followed the Potomac River up to Washington. He circled the Capitol and then started back, arriving at Newport News again at 3:20 P. M. A twenty-mile cross wind was encountered the entire distance, but not the slightest trouble was experienced during the entire flight.

American Aviator Coming Home with a Bride

Lieut. Theodore Marburg, Jr., of the Royal British Flying Corps, and a son of Mr. and Mrs. Theodore Marburg, of Baltimore, has recovered from the injuries which for a long time placed his life in jeopardy and is coming back to America with a bride, Baroness Gesselle de Vavario, a member of one of the oldest families of Belgium. Lieut. Marburg was injured when his aeroplane fell in Northern France. He was in a hospital for months, and to save his life it was necessary to amputate one of his legs. Now he is out of danger, and is with his father and his fiancee in London, intending to sail for America on April 19. Mrs. Marburg, in announcing the engagement in Baltimore last week, said the ceremony would probably be performed in England before her husband, son and the baroness sail for this country.

Illustrative of the interest in the Curtiss activities at the Atlantic Coast Aeronautical Station.

Anthony Jannus, who left recently for Russia in the interests of the Curtiss Company

Atwood Constructing Flying Boat

Harry N. Atwood, the Pennsylvania aviator, has under construction at Williamsport a flying boat which promises to be of real interest. The machine will have a very large wing-spread and the peculiar feature of it will be the steel construction of the boat body. Atwood is developing his own motor, a twelve-cylinder unit which, it is expected, will develop 150 h.p.

"The Aero Club of Illinois now offers to the government the free use of land recently purchased for buildings, located in the center of a 640-acre tract without a fence, building or tree thereon, within the city limits of Chicago.

"There should be an aeroplane for every 200 men sent to Mexico."

Aero Corps for N. Y. State Militia

Assemblyman Stivers, chairman of the Military Affairs Committee of the lower house of the New York State Legislature, has introduced a bill reorganizing the Signal Corps of the National Guard. This bill proposes that the corps shall contain radio companies, aero companies and telegraph detachments. The commanding officer of the corps is to be a major instead of a lieutenant-colonel; the provision for four measures is struck out. The number of captains is increased from two to three, and the number of lieutenants from eight to eleven. A reduction is made in the non-commissioned officers.

Thomas Seaplane Accepted by the Navy at Pensacola

The Thomas seaplane, Type HS, which made a speed record over a five-mile course of 82 miles per hour in its official test at Pensacola, Fla., as reported in AERIAL AGE of April 3, has been accepted by the Government.

Connecticut Aircraft Company Increases Its Capacity

To enable it to carry on its work in the construction of dirigibles, the Connecticut Aircraft Co. has leased the factory building at the corner of Market and Haven streets, New Haven, thereby acquiring an additional 10,000 square feet of factory space. With this addition the company is enabled to start work on new orders which it has recently secured. The company has plans for a rigid machine of a much larger type than the dirigible DN-1, which has just been finished for the United States Navy, and work will now be begun on this type also.

Aeros in the Military Tournament

Plans are being perfected for a great military tournament of the National Guard to be held at Sheepshead Bay on May 20-28. Maj.-Gen. John F. O'Ryan, of the National Guard of the State of New York, in announcing the tournament, said that the first practical demonstration in meeting the problem of the rapid concentration of troops would take place on Sunday, May 21, when 2,000 automobiles would be needed to transport approximately 10,000 troops to Sheepshead Bay. Circulars are being sent out asking car owners to give the use of their cars for this day. It is expected that the National Guard Aero Corps, accompanied by flyers furnished by the Aero Club of America, will participate in the tournament.

A section of the assembly room of the Sturtevant Aeroplane Co., Jamaica Plain, Mass.

Army Aviation Investigation Completed

A special board appointed by the War Department to make an investigation of the Army aviation service, completed its work on the last day of March, and the report was submitted to Maj. Gen. Scott, Chief of Staff. Secretary of War Baker announced at the time of the submission of the report that for the present no information concerning its contents would be divulged.

At the same time it was announced that President Wilson had reviewed the findings of a court martial held in San Francisco several months ago, when Col. L. E. Goodier, Judge Advocate of the Army for the Western District, was tried on the charge of inciting an officer to bring charges against a superior officer. The testimony that Judge Advocate produced in his defense was the direct cause of the investigation just completed and also caused Senator Robinson of Arkansas to introduce a resolution asking for a Congressional investigation of Army aeronautics. This resolution has passed the Senate and is now pending in the House, and on the nature of the findings of the special board will depend the fate of the Robinson resolution.

While no intimation has been given as to the nature of the report, so far as personnel is concerned, it is understood that the board comments upon the inadequate provision made by Congress for the development of aeronautics, notwithstanding repeated appeals from the War Department.

The Provision for Aeronautics in the Hay Bill

Congressional Bill H. R. 12,766, known as the Hay military bill, in Section 9 makes the following provision for increasing the personnel of the aeronautic division:

"That the Signal Corps, exclusive of the aviation section thereof, shall consist of the commissioned officers now allowed by law, forty-seven master signal electricians, one hundred and fifty-five first-class sergeants, two hundred and four sergeants, two hundred and seventy-three corporals, thirty-two cooks, seven hundred and seventy-four first-class privates, two hundred and thirty-three privates; and the aviation section now authorized by law: PROVIDED, That the number of aviation officers in said aviation section shall be increased by seventy-three, and the number of aviation enlisted men shall be increased by twenty-six master signal electricians, fifty first-class sergeants, ninety-three sergeants, one hundred and seventy-one corporals, thirty-six cooks, two hundred and fifty first-class privates, ninety-four privates organized into an aviation school detachment, and such number of aero squadrons as the Secretary of War may direct, not to exceed seven; and each aero squadron shall consist of such numbers of officers and enlisted men of the aviation section as the Secretary of War shall prescribe: PROVIDED FURTHER, That hereafter married officers of the line of the Army shall be eligible for detail to aviation duty upon the same conditions that unmarried officers are now eligible for said duty; and the Secretary of War is authorized to have instructed in the art of flying as many enlisted men of the aviation section as he may deem necessary."

Spring Activity at Marblehead

The opening of real spring weather has greatly stimulated activity at the Burgess Company School at Marblehead, and seaplanes of four different types are now in daily operation. Two pupils, who have been each supplied with new Burgess-Dunne aeroplanes, have resumed the work which was interrupted by the severe winter, and each is nearly ready to take out his certificate.

Oliver Sherwood, one of the instructors of the Interstate Aircraft Flying School

The pupils are Godfrey and Norman Cabot, who, together with George R. Fearing, will give their services and those of their machines to the Massachusetts Naval Reserve in an effort to put the militia of the State in first rank in the country so far as aviation is concerned.

Applications for tuition are coming in so rapidly that they can not be accommodated immediately, and the school promises to run at capacity up to the time when winter conditions will once more put an end to the work.

Other types now flying at Marblehead include a Burgess-Dunne warplane which has been equipped with a Curtiss XV motor of 160 horsepower. This craft is even faster than the 140 horsepower Navy Burgess-Dunne which showed an air speed of 80 miles an hour. Unofficial trials of the new craft show a velocity of close to 90 miles, by far the swiftest of any aeroplane ever used in marine flying.

Moulds for the new boats under construction by the Burgess Company for the Curtiss Aeroplane and Motor Company of Buffalo have been set up, and give an idea of the enormous size of the aeroplane for which they were designed. The length of the boat is more than 50 feet, and it is constructed to lift a total weight of between 10 and 15 tons.

Seaplane constructed by the Burgess Co. at Marblehead for the Navy Aeronautic Station, Pensacola, for school purposes.

Greater Philadelphia panel of aviation, to be presented by Dr. Thos. E. Eldridge and Dr. George H. Simmerman for the best altitude record for two years made in aeroplane or hydro-aeroplane within 100 miles of Philadelphia

Major General Scott on the Air Service

Major General H. L. Scott, Chief of Staff of the United States Army, in a recent communication to the editor of Aerial Age, states that:

"The Signal Corps of the Army is intrusted with the air service of the Army, the most recent auxiliary in the collection and transmission of military information. Air craft are now employed for strategical and tactical reconnaissance and the prevention of reconnaissance by the enemy's air craft; for the direction and control of fire of the field artillery; for the destruction of the enemy's personnel and material by explosive and incendiary missiles and other means; and for the rapid transportation of superior commanding officers. The value of air craft and especially of the aeroplane, in the field of reconnaissance, has been proved beyond the shadow of a doubt. In addition to the acknowledged offensive importance of air craft, there is no longer a question as to the value of the aeroplane in rapid and long-range reconnaissance work, and of its power to secure and to transmit by radio, visual signal or direct-flight information of the utmost importance to armies in the field. So true is this that it seems probable the aeroplane, and, to some smaller degree, all air craft, have altered not the principles of strategy, which are immutable, but the theory and application of grand tactics. It is now recognized that the possibility of brilliant and unexpected blows and surprises by enterprising commanders has been largely eliminated from modern operations of war by the information supplied by the aviators. It is proved that the modern air craft lays open to the field of mental view the whole visible area of the immediate theatre of war and that the commander's vision reaches far beyond the limits of the actual sight of his marching troops. The air craft sees and indicates the larger operations of war and points out to the slowly moving men on the ground not only the object to be attacked or defended, but to reconnaissance troops, especially the cavalry, the objective to be sought, the localities to be searched, and the character of information to be obtained."

FIFTY YEARS OF MERCHANT & EVANS

An anniversary is a notable event in the history of any business, but the fiftieth anniversary of an organization like the Merchant & Evans Company should directly interest the metal trade and its allied industries.

In 1866 Clark Merchant, who had distinguished himself in the United States Navy, and retired with the rank of Lieutenant-Commander, established the business in Philadelphia as Merchant & Company, dealing principally in brass, bronze and copper in all its forms as then manufactured, and trading also in tin plates and other metals that were imported from England or other foreign countries.

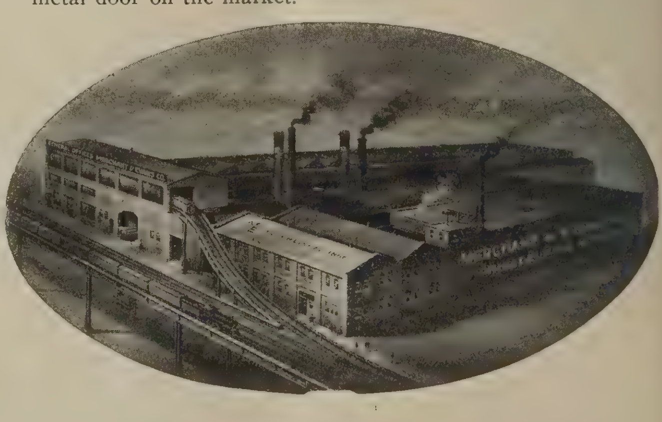
Under his able management the business expanded wonderfully, and soon necessitated removal to larger quarters. At this time the heaviest importation of Merchant & Company was in roofing tins, and chiefly of the brand known as "Gilbertson's Old Method," which was so much superior to any imported terne plate that it far exceeded the sales of any other brand sold in the United States.

After the McKinley Tariff went into effect, the English makers of the "Gilbertson's Old Method" brand desired to reduce the weight of the coating that had been so rigidly guaranteed by Merchant & Company, and, rather than force an inferior tin on the trade, Merchant & Company gave up the agency for this tin, and decided to erect a dipping plant in Philadelphia to produce plates in this country of equal or better quality. As a result, the "Merchant's Old Method" brand of roofing tin was placed on the market and found to be of distinctly better quality than the "Gilbertson's Old Method" brand; in fact, so markedly superior that in a relatively short time the sale of the "Gilbertson's Old Method" brand in this country declined, and finally ceased altogether.

The continued growth of the business made it necessary to open branch offices and warehouses at several important points in the United States, and enlarge the line of metal products. The co-partnership of Merchant & Company was also changed to a corporation, under the style of Merchant & Company, Inc., with Clark Merchant as its president. This style continued until the death of Mr. Merchant, after which Powell Evans assumed control of the business, which is now conducted under the name of Merchant & Evans Company. Powell Evans is an engineer of international experience and, seeing the possibilities available to manufacturers of gasoline propelled vehicles and parts therefor, long before the present European War created such a tremendous demand for motor trucks—added to the already extensive line of metal products handled by Merchant & Evans Company, automobile clutches, alignment-joints, rear axles, jackshaft transmissions, grease cups, metal tire cases, and finally completely erected gasoline motor trucks and tractor trucks.

Mr. Evans is widely known as one of the best posted men in fire prevention and protection affairs in this country, and is chairman of the Fire Prevention Committee of the Chamber of Commerce of the United States, the National Hardware Association and the Fire Prevention Commission of the City of Philadelphia.

During the existence of the old International Sprinkler Company, of which he was president, he designed and marketed very large quantities of sprinkler heads, valves and other approved automatic sprinkler devices. Quite recently he secured laboratory approval of an all-metal type of fire door, of better and more rigid construction than any other metal door on the market.



Top row, reading from left to right: Horace Burt Tuttle, American Student of the Wright School, Augusta, Ga.; C. G. Branson, Canadian, Wright School; Gordon S. Harrower, Canadian, Stinson School, San Antonio, Texas; Charles McNicoll, Canadian, Wright School. Second row, left to right: Arthur T. Whealey, Canadian, Curtiss School, Newport News, Va.; F. C. Biette, Canadian, Curtiss School; Harold M. Hewitt, American, Curtiss School, San Diego, Calif.; George Breadner, Canadian, Wright School. Third row, left to right: L. Carlton Angstrom, Canadian, Stinson School; John R. Bibby, British, Wright School; Norman A. Magor, Canadian, Wright School; A. E. McKay, Canadian, Wright School. Fourth row, left to right: Frank M. Ouge, Japanese, Burns School, Griffith Park, California; Steve Boldy, Hungarian, Burns School; A. York Wilkes, Canadian, Stinson School; Samuel A. Appold, American, Martin School, Los Angeles, California.

AERO CLUB COMMITTEE VISITS THE ATLANTIC COAST AERONAUTIC STATION

A COMMITTEE of the Aero Club of America, consisting of Messrs. Alan R. Hawley, president; Rear Admiral Peary, Professor David Todd, the famous astronomer and veteran aeronautical student; Henry Woodhouse, governor of hte Aero Club; L. D. Gardner, and G. Douglas Wardrop, editor of AERIAL AGE. While the committee chose probably the worst time in weeks from a standpoint of bad weather, it nevertheless was most favorably impressed with the activities of the station and with the progress being made by the students sent there by the Club and appointed by the Militias of the different States.

The object of the visit is summed up in a brief statement, issued by the committee, as follows:

The committee inspected the North Atlantic Aviation Station and met the forty or so Militia officers and civilian aviators and students who are here learning to fly or waiting for their turn to take up training. At present, although there are ten or twelve machines here, which is more than the Army has, there is not sufficient equipment to train all the men who are here for training. But additional machines and equipment is expected from the Buffalo Curtiss plant.

The committee marveled at some of the large aeroplanes which are being flown here. One is a large flying boat of the "America" type, equipped with two motors of 160 horsepower each. This is a particularly valuable machine for naval work, but as was remarked by a member of the committee while a number of other nations have acquired many machines of this type and find them invaluable, the United States Navy has not a single one.

"In case of trouble," said a member of the committee, "our Navy would be just as badly off as the Army is today. The Navy would not have sufficient aeroplanes to last one week."

It was stated by the committee that the North Atlantic Aviation Station has more equipment than either the Army or the Navy have, and the concensus of opinion is that there ought to be not less than twelve such aviation centers in the United States under Federal control, six for the Army and six for the Navy.

The committee stated that every day the Aero Club receives inquiries from people, organizations and newspapers who want to know what steps have been taken to immediately equip aero squadrons with three aeroplanes to each aviator. The Aero Club is ashamed to have to reply that notwithstanding the lesson of the European war and of the Mexican trouble, the only thing done is to order eight aeroplanes. The committee states that forty-eight aeroplanes should be ordered immediately, so as to have three aeroplanes available for every Army aviator now with the Mexican expedition and to organize another aero corps to have ready for emergency.

The National Aeroplane Fund of the Aero Club of America is paying the expenses of the Militia officers and civilian aviators taking their course at Newport News. The Curtiss Company is giving the course of training free for the Militia officers who have been detailed by the adjutant generals of seventeen states.

Alan R. Hawley, president of the Club, states that Congress should provide immediately for establishing six aviation centers on land for the Army and six on water for the Navy. Each aviation center for the Army should have about one thousand acres of flat land, with hangars for twenty-four aeroplanes, buildings for work shops, machine shops, motor shops, storerooms, officers' quarters and barracks for 200 enlisted men. Unless Congress provides for such stations aviation in the Army will never amount to much, and in case of trouble will have to pay dearly for not being ready.

Members of the committee will stay over here today and witness the testing out of the big Curtiss flying boat at the boat harbor. This is the biggest heavier than air flying machine ever built in this country and the biggest seaplane ever built in any country, and the result of the tests are awaited with keen interest in all sections of the world.

Rear Admiral Peary is accompanied by his wife and son, Robert E. Peary, Jr., and are guests at the Hotel Warwick.

The men in the Militia Section of the School are making rapid progress. Seventeen states are represented as follows:

Captain Ralph L. Taylor, Connecticut; Captain R. E. McMillen, Nebraska; Lieutenant H. P. Sheldon, Vermont; Lieutenant Hoyer, Ohio; Lieutenant Barnard Cummings, Colorado; Lieutenant McDaniel, Tennessee; Lieutenant E. Hagnell, Nebraska; Lieutenant H. F. Whrle, West Virginia; Lieutenant D. B. Byrd, North Carolina; Lieutenant Lee Osborne, Kentucky; Lieutenant Arthur J. Coyle, New Hampshire; Second Lieutenant Forrest Ward, Arkansas; Third Lieutenant E. W. Romberger, Mississippi; Sergeant Handley, Oklahoma; Sergeant Lawton V. Smith, Georgia; Corporal G. Johnston, Virginia; Private Hickman, New York; Private Moore, New York.

The military students and instructors at the Atlantic Coast Aeronautic Station.

YOUNGEST FLYER IN AMERICA A SAN ANTONIO GIRL

MISS MARJORIE STINSON, of the Stinson School of Flying, and the youngest flyer in the country, says that their San Antonio field is the best on the Continent. She has seen all the aviation fields in America and flown on them, and declares that this one has no equal.

It is an absolutely level stretch of land, containing 750 acres, giving ample room for landing even for nervous beginners. Settling to the earth is one of the most difficult things in aviation, and adequate landing room is essential to safety. On this ideal field, which is almost as level as the sea, there are no hills for miles—to cause adverse currents, dangerous cross-tides, air-holes and air-bumps, sudden puffs of wind over hilltops. A great deal of it has been rolled until it is as hard and smooth as a floor. Added to these features is the asset of favorable flying weather, made perfect by the glorious winter climate of San Antonio. The value of warm, sunny days for aviation has been proven by the experiments of the Government Aero Squadron of Fort Sam Houston.

Conclusive evidence of the ideal climatic conditions at this field lie in the fact that the students of the school—now twenty-four in number—have lived in tents and the hangar this winter without heating facilities. This, however, will soon be discontinued, for as soon as the carpenters complete the essential hangars and shops for this rapidly developing business, quarters for the men will be erected. The new machine shop for the construction of machines and for repairs, and the new hangar, capable of holding four machines, are nearly completed. There are now three biplanes, with two more in course of construction.

The famous builder of aircraft, Walter L. Brock, of London, is now at the Stinson School of Flying, starting work on a machine of the famous Caudron model, which is the French Wright flyer. "It will be especially adapted to training men in flying," said Mr. Brock. "They are substantial, tough for landing, hard to bring to accident in the air. They have a good spread of wing, sound engine—an admirable machine in every respect."

Mr. Brock has had experience with the Wrights, and has worked considerably in London factories. He is a master designer and builder. A machine from his hands will be turned out within a month, probably, at the Stinson machine shop, and will be the first proved flying machine ever made in San Antonio.

The model used by Miss Marjorie Stinson in graduating her pupils is a Wright B, though it has been changed from a "warper" to one with "flappers"—that is, instead of having to bend the wings to aid in turning and in equilibrium, flaps of canvas have been attached which bend at will against the wind.

Miss Marjorie Stinson, the junior member of the flying part of the Stinson family, is a little girl, still in her 'teens, yet she is teaching big brawny fellows the art of flying and converting them into enthusiastic airmen. Her first pupil in this queerest of schools for a girl, was Mr. J. Gorman, a young Canadian who immediately after his graduation went to England to get into the aerial game, and who now signs himself "Flight Sub-Lieutenant, J. Gorman, R. N., Royal Navy Air Station, Felixstowe, England," and she is especially proud of the fact that Mr. Gorman was graduated in two weeks. He had never before taken a flight, and his success is said to be the record-breaker of all aviation schools.

The Stinsons hold the record as the "flying family" of this country, there being two girls and a brother—Katherine, Marjorie and Edward, and their school is enjoying a constantly increasing enrollment as the need for airmen becomes greater. It is probable that the school will soon be instructing many aviators for the United States aerial reserve. The Government is anxious to have many civilians trained in flying and it is probable that the War Department will give some sort of assistance to young men desirous of becoming reserve military aviators.

Miss Marjorie Stinson, an instructor at the Stinson School of Aviation, San Antonio, Texas.

There are several schools in the country but the Stinson School at San Antonio, owing to the mild, sunny climate, is the only one which has been active all winter. Beginning at daybreak, they sail the air seas until it is necessary to light a bonfire to mark a landing place. Recently sixty-seven lessons were given in one day, Edward Stinson and Miss Marjorie Stinson giving the lessons. Miss Katherine Stinson was busy all day in the construction room.

Most aviators declare that flying is not dangerous. "I feel perfectly safe," Miss Stinson says, "as long as I am high above the ground. Safety lies in elevation. One does not have to contend with chug-holes and air-puffs, and the trees and telephone poles are out of the way. Of course, if one goes up very high and remains there too long a terrible chill comes on; the fingers become numb and there is danger of not being able to control the machine." Miss Stinson has been almost out of sight above the earth several times, and says that at an altitude of 10,000 feet the carburetor of her engine becomes thickly covered with frost and she is chilled through and through.

One of Miss Stinson's exhibition stunts is to go high in the air, turn her car sideways and drop straight down 1,500 feet, then, when the audience-thrill has reached the maximum, suddenly right herself and sail calmly over their heads. She flies also with her machine upside down, loops the loop, and makes sheer plunges for amusement of the crowds. She recently was experimenting with illuminating fireworks, and looped the loop in four successive turns—trailing behind her a fiery train of fireworks which wrote upon the uncharted blackness of the midnight sky a lurid "hand-writing."

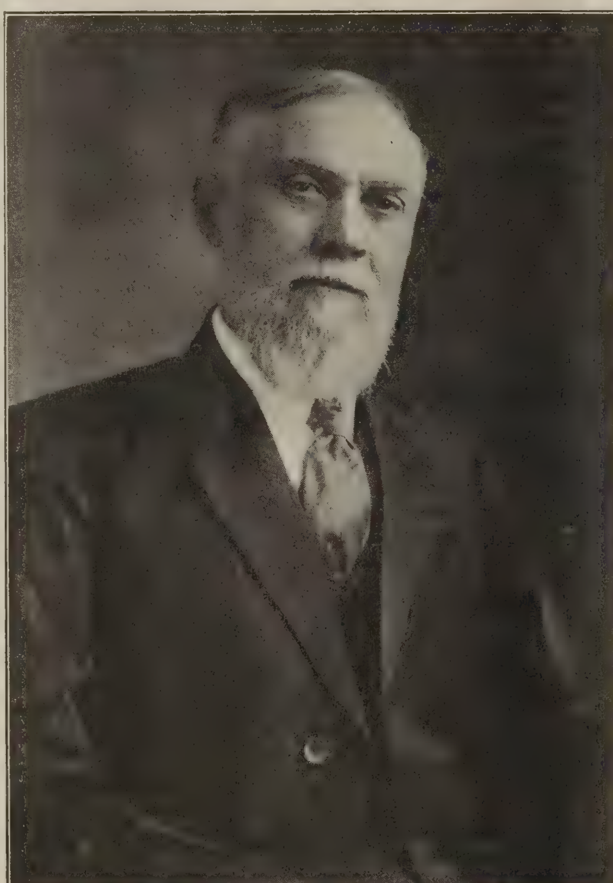
A SECRETARY OF AVIATION?

FROM a modest little measure, which sought only to point the way to the future, to a bill which has attracted national attention. Such is the story of the Lieb bill to create a full-fledged Department of Aviation, with the Secretary thereof in the President's Cabinet, cheek by jowl with the Secretaries of War and the Navy. Further, the bill is still going strong and gaining in momentum—and all in a week. The father of the bill is Hon. Charles Lieb, member of Congress from the first Indiana district.

This bill seems to have been introduced at the psychological moment. The response from the press and the public has been so prompt and so hearty that the author got the surprise of his young Congressional life.

The Aero Club of America heartily endorsed the bill, and so did the National Aerial Coast Patrol Commission, the organization of public-spirited officials and citizens who are pushing the plan for a complete aeroplane defense of our 5,000 miles of coast lines. The members of this commission are Senator Charles F. Johnson of Maine, Senator Morris Sheppard of Texas, Representative Julius Kahn of California, John Hays Hammond, Jr., Hon. Emerson McMillin of New York, Assistant Secretary of the Navy Byron R. Newton, Dr. H. C. Frankenfield, Chief Forecaster of the Federal Weather Bureau, and Dr. E. Lester Jones, Superintendent of the U. S. Coast and Geodetic Survey. The chairman of the commission is Rear Admiral Robert E. Peary, U. S. N., retired.

It is an interesting coincidence that within six weeks of the organization of the National Aerial Coast Patrol Commission, Congressman Montague of Virginia has introduced a bill providing for an aeroplane coast patrol in connection with our efficient coast guard service, and that Mr. Lieb's far-reaching proposal should be made a few days later.



Hon. Charles Lieb of Indiana

The Lieb bill has been referred to the Committee on Military Affairs and the author firmly believes that at least it will be reported out favorably. The skeleton of the proposed Department of Aviation would be a Secretary, an Assistant Secretary and the necessary central office force, a bureau of land operations, a bureau of naval aeronautics, a bureau of signal corps, a bureau of construction, a bureau of aeronautical research, a bureau of motor power, a bureau of learning, and a bureau of personnel and accounts. The work would be started by the detail to the new department of officers and enlisted men of the Army and Navy Departments on aviation duty at the time. They would stay with the new department until they reached the age of 30, then to return to their respective departments. There would also be taken over the present office of naval aeronautics and the aviation section of the Army Signal Corps.

It is also provided that "it shall be the province and duty of the Department of Aviation to supervise and promote all matters pertaining to aviation in its relation to the Army and Navy in times of war and peace, and to endeavor to improve and develop the science of flying as it may be deemed desirable in the public interests, and for the purpose of extending commerce or such other ends as may be found practicable for the general betterment of the country; and said department shall collect and disseminate information relating thereto, as the needs may require."

Congressman Lieb is a Democrat and is serving his second term as the representative of the first Indiana district. He is of German stock and has lived in Rockport almost from the day of his birth 64 years ago. He graduated from the Rockport Collegiate Institute and from Bryan & Stratton's Business College at Louisville, Kentucky. He returned to Rockport a skilled accountant, and grew wealthy in a few years as a manufacturer of hardwood lumber, as a dealer in lumber and logs, and as a contrctor. He is a director of the Farmer's Bank of Rockport and a director in several other enterprises.

Mr. Lieb's public services embrace several terms in the Rockport City Council, three sessions in the Indiana General Assembly, and two terms in Congress—and the end is not yet. He was in the Assembly when first elected to Congress in 1912. Mr. Lieb was married in 1877 to Miss Katherine Mohr, and has one daughter, Mrs. Archibald C. Stevenson.

In devising his plan for an aviation department Representative Lieb was not actuated by a fly-by-night emotion. It was the result of careful thought and investigation for nearly a year, following an invitation visit which he and other members of the House Committee on Rivers and Harbors paid to the Army aviation camp at San Diego last summer. Just what he thinks of the aerial problem which is facing this country is shown by the following interview he gave to our representative:

"The creation of a Department of Aviation would clear the deck for the development of the aviation service to the highest point of perfection. Such a department would eliminate the confusion that has existed between the Army and Navy Departments on the question of how best to build up and maintain the efficiency of the aviation service. It is freely admitted that there is room under existing conditions for the improvement of the service. A Department of Aviation opens the shortest route through which the task of increasing the importance and efficiency of this service can be brought about in the shortest time possible.

"Not until the beginning of the European war did this country realize how important a part the aeroplane plays in modern warfare. It also opened our eyes to the dangers confronting our own country in not having aerial squadrons in sufficient numbers to hold our own in case of attack. The chase after the bandit Villa emphasizes the weakness of our aviation service as now controlled. It needs to be reorganized by experts who best know its needs.

"Aviation in warfare has developed at such an astounding rate that it has been an impossible task for the United States to keep up with the times. In facts, it will be impossible to stand abreast with the other countries as long as the subject is dealt with by two distinct departments of the government, instead of under one head. If any inefficiency is charged by anybody it cannot be laid to either the Navy or the War Department, but to the system. Responsibility placed in one department would tend to bring a condition of efficiency that could not be attained any other way.

"Further, aviation is as much a part of the preparedness program as the Army or the Navy. The creation of a distinct department for this work should be undertaken now. The subject is getting to be such a big one that it will eventually be confusing if allowed to go along under the jurisdiction of two departments. I cite England as an example. That country had no definite aviation policy, and when the war broke out England floundered under a great handicap. They found themselves greatly behind Germany in the matter of

(Continued on page 151)

THE NEW MODEL 5 140-H.P. STURTEVANT

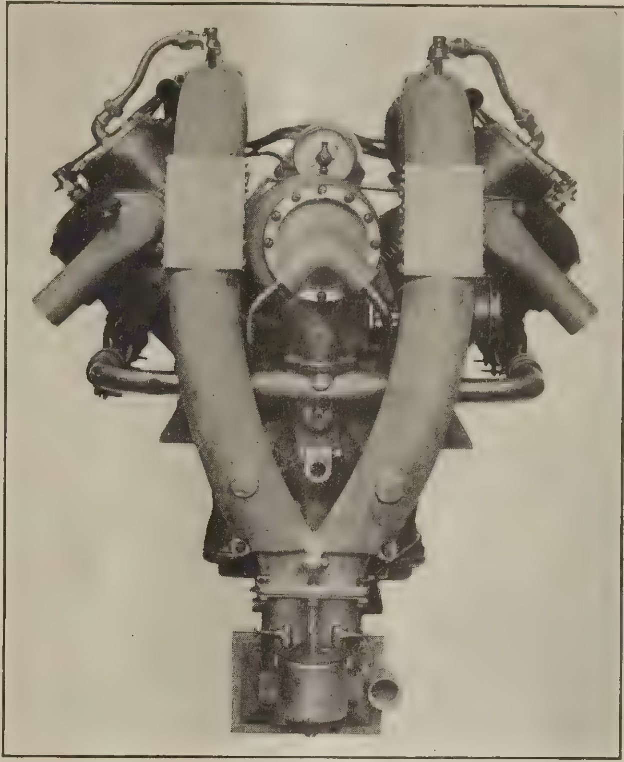
The B. F. Sturtevant Co., of Hyde Park, Mass., are now prepared to equip their Model 5 140 h.p. eight-cylinder V type aeroplane engines with gravity feed carburetors.

Referring to illustration No. 1 it will be seen that the carburetor is located beneath the level of the engine bed on the rear end of the motor. This installation will permit of a full gravity feed under all conditions, an important feature in certain types of aeroplanes.

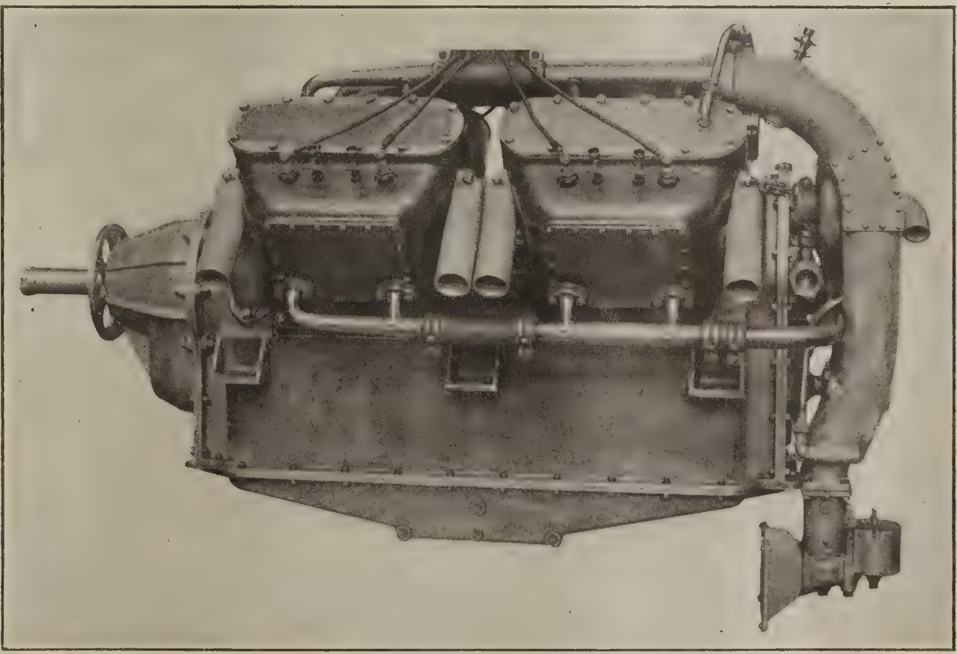
The carburetor is connected to the cylinders by means of special aluminum manifolds. These manifolds, produced in the B. F. Sturtevant Co.'s own foundry at Hyde Park, Mass., are very remarkable castings in themselves, having water jackets cast integral.

A series of tests proved conclusively that this type of manifold not only provides the cylinders with a very homogeneous mixture, but also materially increases the fuel economy. It was also observed that the carburetor was free from outside changes in temperature, this being a particularly valuable feature at high altitudes.

Gravity feed carburetors with water jacketed manifolds have been supplied on the six Sturtevant eight-cylinder, direct-drive aeroplane engines that are being installed in the U. S. Navy school machines built by the Sturtevant Aeroplane Co., of Jamaica Plain, Mass.



The 140 h. p. Sturtevant, showing the placement of the new gravity feed carburetor.



A Secretary of Aviation?

scouting; in defending the country against Zeppelin attacks of the enemy; and in many other respects.

"It should not be said to the shame of our generation that we did not trouble to guard in the air what our forefathers won on land and sea. War has become more scientific and will continue to become more scientific than anything which has preceded it. All of which makes our foes, should we have any, more dangerous. That being the case, it seems most important that the organization of this great service should not be left to a divided responsibility. There should be one responsibility and one only.

"All the trained brains of this country are needed to solve the great problem, and a department for that and other purposes is needed to give us the desired results. I refer to the responsibility and provision of powerful enough aeroplanes; second, the provision for powerful enough anti-aircraft guns; third, the construction of the Zeppelin type for this country. In time it is possible that the new air warfare will be perhaps of so tremendous a character that, who knows, it might supersede Armies and Navies."

NOTES ON THE DIMENSIONAL THEORY OF WIND TUNNEL EXPERIMENTS

By EDGAR BUCKINGHAM
UNITED STATES BUREAU OF STANDARDS

Introduction

The forces which will act between a solid body and a fluid in contact with it in consequence of a relative motion of the two, cannot, except in a few of the simplest cases, be predicted by computation from the size and shape of the body, the relative velocity, and the physical properties of the fluid: the information can be obtained only from experiment. Such experiments may be expensive or impracticable, and it often appears desirable to get the required information, in advance of the final decision on the design of a structure which is to be subject to aerodynamic or hydrodynamic forces, by making preliminary experiments on a small model of the proposed structure.

In order that the results of such observations shall be interpretable as definite statements about the behavior of the full-sized original of which the model is a copy, certain requirements must be satisfied, and when they are satisfied the original and the geometrically similar model are said to be dynamically similar. The conditions for dynamical similarity are bound up with the general question of the possible forms of equations which describe relations subsisting among the physical quantities involved in physical phenomena.

Nature of the Problem to Be Discussed

Let us suppose that a solid body is moving, with the constant velocity S, through a fluid which is itself sensibly at rest at points far distant from the body; and let us consider the forces exerted on the body by the surrounding fluid. Since these forces are evidently due to the relative motion, they would remain unchanged if the body were held at rest and the fluid made to flow past it with the velocity $(-S)$. The boundaries of the fluid are supposed to be so distant from the solid body that no sensible disturbance reaches them, and their nature can then have no influence on the forces with which we are concerned and need not be further referred to. If the fluid is a liquid with a free surface, the foregoing condition requires that the moving body be so deeply immersed as not to cause any surface disturbances.

Let R be any force exerted by the fluid on the body; for example, the component in any specified direction of the force on some particular part of the solid surface; or, to make it more definite, let R be the total head resistance in the direction of motion. Then R will depend on and be completely determined by the relative speed, the size, shape, and attitude of the body, and the mechanical properties of the fluid; and there must be a definite relation connecting these various physical quantities, which can be described by an equation. We wish to consider the nature of this equation in so far as it is fixed by the natures of the separate quantities involved in it.

The Physical Quantities Which Influence Fluid Resistance

Let D be some linear dimension of the body, such as its greatest length. The shape of the body and its attitude, *i. e.*, its orientation with regard to the direction of motion can be specified by stating the ratios of a number of lengths to the particular length D. If these ratios are denoted by $r', r'', r''', \ldots$, etc., the size, shape, and attitude of the body are completely specified by the values of $D, r', r'', \ldots$, etc.

The properties of the fluid which determine its mechanical behavior are its density ρ, its viscosity μ, and its compressibility. Instead of the viscosity, it is generally more convenient to use the kinematic viscosity $\nu = \frac{\mu}{\rho}$ which will do equally well when ρ is given. And similarly, the speed C of sound waves in the fluid is fixed by the density and compressibility so that, conversely, C together with ρ fixes the compressibility. The properties of the fluid which concern us may therefore be specified by stating the values of the density ρ, the kinematic viscosity ν, and the acoustic speed C in the fluid.

We have now enumerated the quantities on which the force R may be supposed to depend, and if nothing has been overlooked there must be a complete relation connecting R with the other quantities. We may state the fact that such a relation subsists by writing the equation

$$f(R, S, D, r', r'', \ldots, \rho, \nu, C) = 0, \qquad (1)$$

and our first task is to obtain from general principles any information we can about the form of this unknown function f, which will enable us to restrict the amount of experimentation required to finish the work of finding the form of the equation.

Application of the Principle of Dimensional Homogeneity

By the well known "principle of dimensional homogeneity," all the terms of a complete physical equation must have the same dimensions, and this fact enables us to simplify equation (1). Let Π represent a dimensionless product of the form

$$\Pi = R^{\alpha} S^{\beta} D^{\gamma} \rho^{\delta} \nu^{\epsilon} C^{\zeta}, \qquad (2)$$

the numerical exponents α, β, γ, etc., being such as to satisfy the dimensional equation

$$[R^{\alpha} S^{\beta} D^{\gamma} \rho^{\delta} \nu^{\epsilon} C^{\zeta}] = [1] \qquad (3)$$

when the known dimensions of R, s, D, ρ, ν, and C are inserted. Then it may readily be shown:[1] 1st, that since three fundamental units are needed as the basis of an absolute system for measuring the six kinds of quantity, R, S, D, ρ, ν, and C, the number of possible independent expressions of the form (2) is 6−3 or 3; and 2d, that if these expressions are denoted by Π_1, Π_2, Π_3, any correct equation involving the quantities which appear in equation (1) and no others, must necessarily, in order to have all its terms of the same dimensions, be reducible to the form

$$F(\Pi_1, \Pi_2, \Pi_3, r', r'', \ldots) = 0. \qquad (4)$$

In addition to the dimensionless ratios r', r'', etc., there now appear in the equation only three instead of the original six variables, so that the labor of determining by experiment the form of the unknown function is much less than if we had to deal with all six variables.

The More Specific Form of the Equation of Fluid Resistance

The dimensions of the quantities on the familiar mass, length, time, or $[m, l, t]$ system are:

$$[R] = [mlt^{-2}], \qquad [\rho] = [ml^{-3}],$$
$$[S] = [lt^{-1}], \qquad [\nu] = [l^2t^{-1}],$$
$$[D] = [l], \qquad [C] = [lt^{-1}];$$

and we see by inspection that the expressions

$$\Pi_1 = \frac{R}{\rho D^2 S^2}, \quad \Pi_2 = \frac{DS}{\nu}, \quad \Pi_3 = \frac{S}{C}$$

are dimensionless products of the required form (2), and that they are independent. Accordingly, we know that equation (1) must be reducible to the form

$$F\left(\frac{R}{\rho D^2 S^2}, \frac{DS}{\nu}, \frac{S}{C}, r', r'', \ldots\right) = 0. \qquad (5)$$

This equation is fundamental to the experimental study of the hydrodynamic or aerodynamic forces acting on totally immersed bodies.

Solving for Π_1 we now have

$$\frac{R}{\rho D^2 S^2} = \phi\left(\frac{DS}{\nu}, \frac{S}{C}, r', r'', \ldots\right), \qquad (6)$$

in which the form of the unknown function ϕ remains to be found, if it needs to be found at all, by experiment or by other than dimensional reasoning.

Courtesy Smithsonian Institution Report.

Simplification When Compressibility May be Disregarded

A simplification is possible when the motion is not rapid enough to cause any sensible compression in the fluid. In this event it is immaterial what the compressibility is, so that $\frac{S}{C}$ may be omitted from consideration and equation (6) reduces to

$$\frac{R}{\rho D^2 S^2} = \phi\left(\frac{DS}{\nu}, r', r'', \ldots\right). \quad (7)$$

The approximation attainable when compressibility is thus left out of account depends on the value of $\frac{S}{C}$. If $\frac{S}{C}$ is a small fraction, as it nearly always is with liquids, equation (7) is a satisfactory substitute for (6). The speed of sound in air under ordinary conditions is of the order of 1100 feet per second, or 750 miles per hour. For rifled projectiles $\frac{S}{C}$ may be as high as 2.5 or even 3, so that equation (7) would be entirely misleading if used in studying projectile resistances. But at the speeds which occur in aeronautics, with the exception of propeller tip speeds, the ratio $\frac{S}{C}$ is a sufficiently small fraction that the air acts nearly like an incompressible fluid, *i. e.*, like a liquid of the same density and viscosity; and equation (7) may be used as a sufficiently approximate substitute for the more general equation (6).

Equation (7) supplies the basis for the experimental investigation of the aerodynamic problems which occur in connection with aeronautics and aviation by means of reduced scale methods.

Restriction to Geometrically Similar Bodies

Let us now confine our attention to a series of bodies of various sizes but all of the same shape, and presented to the wind in the same attitude. The bodies are geometrically similar, and any one may be regarded as a reduced or enlarged model of any other. The ratios $r', r'', \ldots$ are now constants, so that equation (7) assumes the simpler form

$$\frac{R}{\rho D^2 S^2} = \psi\left(\frac{DS}{\nu}\right), \quad (8)$$

in which the form of the unknown function ψ of the single argument $\frac{DS}{\nu}$ remains to be determined by experimenting on bodies of the given series. The nature of this function will depend on the shape and attitude of the bodies but not on their size, if our disregard of compressibility, leading from (6) to (7), was a justifiable approximation.

The obvious procedure, in investigating ψ by analyzing the results of experiments, is to plot observed values of $\frac{R}{\rho D^2 S^2}$ against values of $\frac{DS}{\nu}$ and draw a curve through the points thus obtained. If we are using air of constant density and viscosity the experiments may consist most simply in measuring, by the aerodynamic balance, the force R exerted on a given body at various values of the wind speed S. Variations of $\frac{DS}{\nu}$ may equally well be produced by varying D while S is constant, *i. e.*, by experimenting at a fixed speed but with a series of models of different sizes; or, D, S, ρ, and ν may all be varied simultaneously. But while such experiments furnish a desirable check on the results obtained when S alone is varied, they are not necessary, if compressiblity is negligible; for it is immaterial whether $\frac{DS}{\nu}$ is changed by changing D, S, or ν.

If the plotted points obtained in any of these ways do not all lie on a single curve, within their experimental errors, equation (8) is not accurate enough. And if the models have been exactly geometrically similar, we must conclude that compressibility has played some part in the phenomenon. This means that in the more general equation

$$\frac{R}{\rho D^2 S^2} = \phi\left(\frac{DS}{\nu}, \frac{S}{C}\right) \quad (9)$$

obtained by applying (6) to geometrically similar bodies, the effects of varying $\frac{S}{C}$ are not of entirely negligible importance.

Head Resistance Proportional to S^2; Viscosity Negligible

At ordinary speeds and for bodies that are not too small, experiment shows that in air of standard density, R is very nearly proportional to S^2 It follows that, to the degree of approximation to which equation (8) is valid, $\psi\left(\frac{DS}{\nu}\right)$ is merely a constant and is independent of the values of D, S, and ν. If we write

$$\psi\left(\frac{DS}{\nu}\right) = K,$$

equation (8) reduces to

$$R = K\rho D^2 S^2 \quad (10)$$

As is seen by referring to equation (7), K depends on the values of $r', r'', \ldots$, etc.; it is a shape factor for the given series of geometrically similar bodies in the given attitude.

It is to be noted that viscosity does not appear at all in equation (10), so that when the resistance is found to be proportional to the square of the speed, if compressibility is negligible the value of the viscosity is of no importance. This is not equivalent to saying that viscosity plays no part at all in the phenomena; for if viscosity did not exist there would be no eddies of finite size, no dissipation, and at a constant speed no resistance. It means, rather, that the drag on the body by the fluid is due to the continual drain of energy needed to set up anew the turbulent eddying motion about the body; and that when these eddies have once been created it makes no difference how fast they are dissipated by viscosity after the body has left them behind.

The Critical Speed

In the foregoing case of resistance proportional to S^2, the plot of $\frac{R}{\rho D^2 S^2}$ as ordinate against $\frac{DS}{\nu}$ as abscissa gives, of course, a horizontal straight line for bodies of a given series. But if the experiments are carried down to smaller and smaller values of $\frac{DS}{\nu}$, a critical value may be reached where the relation ceases to hold and the character of the fluid motion changes very rapidly, though apparently not discontinuously, so that the function ψ ceases to be a constant for low values of $\frac{DS}{\nu}$. For a given body in a given medium this critical value of $\frac{DS}{\nu}$ corresponds to a critical speed S_C which may be computed *à priori* from the values of D and ν, if the critical value $\left(\frac{DS}{\nu}\right)_C$ has once been determined for bodies of the given shape by varying any one of the variables D, S, and ν, or all together. Eiffel's observations on spheres[1] confirm the foregoing statements when we take into consideration not merely a single speed for each diameter but the whole critical range within which the rapid change in the form of ψ occurs.

Mr. Hunsaker's observations on sharp cornered disks of different diameters, but the same thickness, are very interesting as showing the possible importance of such sharp edges or corners. The disks were not geometrically similar; but the corners at the edges were not only nearly similar but, inch for inch, very nearly identical. Accordingly, that part of the total resistance which may be regarded as due to the sharp corners at the edge reached its critical value always at about the same speed, irrespective of the diameter of the disk which was bounded by the edge. The rapid change in the total resistance near this speed seems to indicate that the "corner resistance" formed a considerable fraction of the whole.

The occurrence of a critical speed for a given body in a given attitude is paralleled by the practically much more important phenomenon of the occurrence of a critical attitude at a given speed. Just as the nature of the fluid motion and the law of resistance of a given body change rapidly at a certain critical range of speed, so there are similar rapid changes in the motion and the forces at the critical angle of attack for a given aerofoil at a given speed.

(To be Continued)

THE AERO COAST PATROL BILL

THE U. S. Treasury Department is so strongly impressed with the aerial coast patrol system which the Aero Club of America and Admiral Peary are urging that Congressman Montague of Virginia, at the instance of Acting Secretary Byron R. Newton, of the Treasury Department, last week introduced a bill providing for such a patrol as a part of the Treasury's Coast Guard and Life Saving Service.

The project, which has been developed so far by private subscriptions, aims to establish aerial coast patrol stations along the Atlantic Coast, the Pacific Coast, and on the Great Lakes, at intervals of 100 miles from each other.

The stations are to be established also in the interior, so as to interconnect the East to the West and the North to the South.

In case of danger, a station on one of the seaboards can instantly advise the entire country of the impending danger, and the aeroplanes from the different stations can, if needed, be mobilized at any one desired point.

The operation of the aerial corps in stormy weather, to bring aid to stranded and wrecked ships and men imperiled by angry seas, and in navigating in air, out of sight of land, in search of distant derelicts in the path of navigation, would be a battle with the elements that would provide a training and result in an efficiency for war duty that could scarcely be obtained by any manœuvers, experimentation or practice with the purely military purpose in view.

The aerial coast patrol also has the virtue of rendering an active, necessary service day by day, instead of being a dead charge to military efficiency, like the Navy. It can be marked off the books as an expense for preparedness in view of the great work and tremendous saving of property effected by the coast guard, which would be augmented and furthered by an aerial corps, an economy that is now many times the cost of maintaining and operating the coast guard.

These features of the plan, it seems certain, will appeal to Congress—with public opinion clamoring for preparedness and legislation impeded by the tremendous expenditures involves, without return other than security. That the humane and utilitarian services of a coast guard aerial corps could be converted to war purposes is regarded as a strong factor in favor of the enactment of the desired legislation.

The bill proposes the establishment of aeronautic stations along the coasts of the United States. There is to be at least one elaborate repair shop, where seriously injured aircraft may be made over.

A number of officers are added to the coast guard personnel, to provide the corps of aeronautical navigators. The grade of aeronautical machinist is created, with authorization to designate men to such posts. The pay of officers and men attached to the aerial corps is to be 25 per cent. additional to the pay of their grade.

The aircraft that will be the principal vehicle of the coast guard aerial corps, if its establishment is accomplished, will be a seaplane, fitted with wireless and a gyroscope compass. The wireless will be intended for communication with shore stations and with coast guard cutters and will have a radius of fifty miles or more.

A coast patrol by airships would seem a natural function of the coast guard. The coast guard is regarded also as offering the best facilities and having the best machinery for the maintenance and operation of a fleet of airships for coast duty and oversea flight. Navigation is one of the qualifications required by the sky pilot under these conditions. Officers of the coast guard, who will be the operators of the airships, are learning navigation as part of their sea duties.

Rear Admiral Robert E. Peary, U. S. N., Chairman of the National Aerial Coast Patrol Commission, and who has done splendid work for the establishment of the first aerial coast patrol station near Portland, Me., issued a statement at Washington, soon after Congressman Montague's bill was introduced, in which he said:

"Representative Montague's bill to establish a Coast Guard Aerial Corps and Representative Lieb's bill to create a Department of Aviation with a Secretary in the Cabinet are steps in the right direction. The first is eminently and immediately practical, and the second is a broad look ahead and an indication of what may be a reality in a few years.

"Former Governor Montague's bill is in line with the propaganda of the National Aerial Coast Patrol Commission and the Aero Club of America. The difference is in support. Our plan calls for popular support, while the Montague bill asks for a Federal appropriation, with the service under the coast guard."

Text of the Coast Guard Aerial Corps Bill

Congressman Montague's bill to create a Coast Guard Aerial Corps, and officially known as H. R. 13830, is given below. This bill was introduced in the House of Representatives, referred to the Committee on Interstate and Foreign Commerce, and is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled—

Section 1. That for the purpose of saving life and property at sea contiguous to the coasts of the United States, and for the national defense, there is hereby created the Coast Guard Aerial Corps, to be operated as a component part of and by the personnel of the United States Coast Guard.

Section 2. That for the purposes of this Act the Secretary of the Treasury is hereby authorized to establish stations, in connection with existing Coast Guard stations, at such points on the Atlantic, Gulf of Mexico, and Pacific coasts as he may deem advisable to maintain an efficient aerial patrol of the entire coast line. He is further authorized to equip such stations with such numbers and types of aircraft as he may deem necessary for the purpose.

Section 3. That in order to provide the operating force, the numbers of officers authorized in the existing grades of second and third lieutenants and second and third lieutenants of engineers in the Coast Guard are hereby increased fifteen in each of said grades; an officer in these grades may be assigned to aviation duty who may qualify to the satisfaction of the captain commandant for those duties. A grade of warrant officers in the Coast Guard, to be known as aeronautic machinists, is hereby authorized; it shall consist of sixty expert machinists, who shall have the same status as other warrant officers. Commissioned officers serving with the Aerial Corps shall be entitled to and be paid 25 per centum additional pay to that which they would otherwise be paid on ordinary Coast Guard duty; aeronautic machinists of the grade of warrant officers shall receive 25 per centum additional pay to that which they would otherwise be paid as machinists in the Coast Guard.

Section 4. That at one of the Coast Guard stations, to be selected on account of its adaptability for the purpose of special instruction in aeronautics, the Secretary of the Treasury is hereby authorized to employ one expert instructor in aeronautics, at a salary of $4,000 per annum, and one assistant instructor, also skilled in aeronautics, at a salary of $3,000 per annum.

Section 5. That to carry out the purposes of this Act, there is hereby appropriated for the purchase or construction of aircraft, alterations and additions to existing stations, to provide suitable accommodations for the machines and men employed, for not more than ~~three repair stations~~, and for travel and other incidental expenses necessary for the formation and establishment of the Aerial Corps, out of any money in the Treasury not otherwise appropriated, the sum of $300,000 to remain available for a period of two years from the date of passage of this Act.

FOREIGN NEWS

AUSTRIA

One of the most thrilling of all the aerial combats that have thus far been reported is told in an official statement issued by the Austrian-Hungarian Admiralty, and which follows:

"Replying to a visit of Italian aviators to Laiback, Adelsberg and Trieste, an Austro-Hungarian squadron of ten naval aeroplanes bombed with destructive success the railroad station, two gasometers, the docks and the barracks of Ancona today. Several fires ensued. Counter attacks of two enemy aeroplanes with machine guns were easily repulsed.

"One Austro-Hungarian aircraft was forced to land before the port by the fire of three aircraft batteries. Another aeroplane, piloted by Flying Master Molnar, landed at the side of the wreck, picked up the two inmates and destroyed the aircraft. Molnar, in consequence of the rough sea, was unable to rise again.

"An enemy torpedo boat and two other ships from the port attempted to capture the Austro-Hungarians, but were forced to withdraw by the bombs and machine gun fire of other Austro-Hungarian aeroplanes. Finally two aeroplanes, piloted by Naval Cadet Vamos and a lieutenant, were sent out and rescued all four inmates of the damaged aeroplane and burned it.

"This action was carried out under the fire of the machine guns and bombs of two Italian hydroaeroplanes, which flew at an altitude of only one hundred metres.

"The result of the attack was two Austro-Hungarian aeroplanes lost. All the other aeroplanes and all the aviators engaged in the attack returned safely."

FRANCE

There were fifteen aeroplane duels in one day, April 4, in the Verdun region, during the course of which a double motored German machine was brought down near the pond of Hauts Fourneaux. Another German machine fell down near the wood of Pilly, and a third German aeroplane fell vertically to the ground. All the French pilots returned without suffering damage.

During the night of April 3-4 a French aerial squadron threw down fourteen shells on the railroad station at Nantillois and five others on the barracks of the enemy at Damvillers.

In its summary of aerial operations during the last month the War Office claims that 35 aeroplanes of the enemy were put out of business and it admits losses of thirteen French aeroplanes.

"During the month of March," says the statement, "our aviators displayed much activity along the whole front, particularly in the region of Verdun.

"In the course of numerous aerial combats thirty-one German aeroplanes were brought down by our pilots, nine of which fell in flames or were crushed on the ground within our lines, and twenty-one fell inside the German lines.

"No doubt exists regarding the fate of these twenty-two aeroplanes which our pilots had attacked within the enemy lines. Twelve of these were seen to fall in flames, and ten were driven down in spirals under the fire of our aviators.

"In addition, four German aeroplanes were brought down by our special guns, one of them within our lines in the environs of Avocourt and three inside the enemy lines—one in the neighborhood of Suippes, one near Nouvion and one near Ste. Marie-a-Py.

"To this total of thirty-five German aeroplanes destroyed during the month of March should be opposed the number of our aerial losses, which reached thirteen aeroplanes, as follows:—One French aeroplane brought down inside our lines and twelve French aeroplanes brought down within the German lines.

"The great disproportion between the falls effected within the French zone and those within the enemy zone, with reference to French and German aeroplanes, is significant. According to a document found on a prisoner, German pilots received the order to cross their own lines as little as possible. The results of the month of March prove, on the other hand, that our pursuit aeroplanes have flown incessantly over the territory of the adversary seeking combat."

Although he has been in the service only three months, Lieut. Rene Doumer, son of Paul Doumer, former President of the Chamber of Deputies, has put two German aeroplanes out of action. On March 10 he engaged in aerial battle with three German aeroplanes, shooting down one and compelling another to land. A few days later he attacked a Fokker and sent it down in flames behind the German lines.

Lieutenant Le Bourhis, the first French military aviator to use a parachute, is dead of wounds received in an aerial encounter in the vicinity of Verdun. His best known exploit was the capture of a large German aeroplane with a grappling iron in August of last year. He thus described this incident in a letter to a friend:

"I had been flying for hours, dragging a grappling hook at the end of a long cable behind my machine. Suddenly a very large black areoplane with white crosses appeared. I sent my machine whirling over him. A hook got him, and he swung at the end of my line like a toy. All went well for a few minutes. Then my motor began to fail. I caught glimpses of deep trenches and a wide river beneath me. I struggled furiously, with the German machine still balanced at the end of the rope. I began to fall more rapidly. A wing broke. Everything turned black. I was falling like a stone."

When the lieutenant regained consciousness he was safely on land, not badly injured. He attributed his escape to the probability that the cable attached to the German aeroplane tightened as he was falling and eased the force of the descent.

GERMANY

An official statement issued by the War Department admits the loss of fourteen German aeroplanes during the month of March but claims that the British and French lost forty-four aeroplanes in the same period. The statement follows: "During the month of March in aerial engagements on the western front the Germans lost fourteen aeroplanes, of which seven were lost in air combats. Three were shot down from the ground and four are missing. The British and French lost forty-four aeroplanes, of which thirty-eight were lost in air combats, four were shot down on the ground in our front and two were forced to land within the German lines. Twenty-five enemy aeroplanes fell into German hands. The fall of nineteen others was noticed."

German newspapers declare that important military damage was done in England by the Zeppelin raiders on the night of March 5-6. "At Hull, on the Humber," says a dispatch summarizing the claims, "a magazine filled with ammunition and a building with provisions belonging to the government were destroyed. The dock walls were heavily damaged in several places, notably those of one of the new docks. Numerous hoisting cranes, big steamships and a tank steamship were also badly damaged, and two men of war were struck, one forward and the other aft. Of the city of Hull a large section was completely burned out, two blocks being destroyed, and the railroad station badly damaged. The coal colliery road is said to be a mass of ruins. The facts mentioned have been accurately ascertained by German newspapers, which state that the British censor suppressed all reports regarding damage in this raid by the Zeppelins, the operations of which had been favored by excellent weather."

Newspapers in all of the region about the Zeppelin manufacturing plants expressed great satisfaction over the recent big raids on England and predict that throughout the spring these raids will continue with London as the principal point of attack. Count Ferdinand Zeppelin, who is at Stuttgart, received many telegrams and letters of congratulation for several days after the first raids.

GREAT BRITAIN

England expects that the German threat to continue to raid the Island with Zeppelins throughout the spring will be made good, but the military spirit of the populace is increased rather than diminished by these attacks and by the prospect of others. On the night of April 5 the last raid, in a series of five Zeppelin invasions occurring within six days, was made. One person was killed and eight injured, though there was a total of twenty-four explosive and twenty-four incendiary bombs dropped over the northeastern counties. Three Zeppelins crossed the channel for this attack. The first was driven off by artillery at 9 p. m. after dropping five bombs. The German Admiralty claims that this raid was a success in that it "destroyed a large iron work plant with its blast furnaces and other extensive establishments near Whitby, after having first put out of commission with exploding bombs a battery north of Hull. The raiders further attacked factories at Leeds and in the surrounding district, as well as several railroad stations in this industrial district."

In retaliation for the bombardment of Dunkirk by a Zeppelin on April 2, thirty-one Allied aeroplanes on the following day raided German towns. Eighty-six bombs of large calibre were dropped on the cantonments at Keyem, Essen, Terrest and Houthulst. The great Krupp gun plant is at Essen. A French air squadron also bombed the station at Conflans. The Zeppelin that attacked Dunkirk is believed to have been one of the fleet that raided the southeastern part of Scotland and the southeastern counties of England.

SWITZERLAND

The Swiss government has taken up with Germany the matter of marking the frontier with signs visible a long distance by day and illuminated by night so as to avoid a repetition of the mistake recently made when German aviators bombarded Porentruy, a Swiss village. Germany has apologized to Switzerland for this attack and has promised to punish the two aviators who supposed that they were over Belfort. The colonel of the Swiss regiment stationed at Porentruy has been removed from his command and sentenced to six days' imprisonment for having failed to fire on the aviators who attacked his town.

ITALY

An apparatus based on a new principle, and which it is intimated will make a sensational change in the operation of aeroplanes and dirigibles, has been invented by Guglielmo Marconi. Mr. Marconi has also carried on important wireless telegraphy researches with great success. His inventions, it is announced in Rome, will be employed in the Italian Army, after which they will be placed at the disposal of the Allies of Italy.

JAPAN

The *Aeronautic World*, of Tokyo, Japan, records an event in Manchuria on March 13 when Lieut. Sawada flew an army aeroplane from the parade ground of Hoten. It was the first time that an army aeroplane of Japan had been seen in Manchuria. Other officers made trial flights over the parade ground after Lieut. Sawada's initial voyage, and later the construction of the flying machine was explained to an immense crowd of spectators.

TURKEY

Many Turks were killed in encampments near Smyrna and Fort Kastlaki, guarding the entrance to the Gulf of Smyrna, when these camps were bombarded by a squadron of Allied aeroplanes last week.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The McLaughlin Tractor Hydro

The model shown in the accompanying drawing was constructed by George F. McLaughlin, of Brooklyn, N. Y., a member of the "Aero Science Club." This model, as can be seen from the accompanying drawing, was carefully designed and constructed by Mr. McLaughlin and on several occasions made short flights.

Frame.—The two 30-in. main sticks for the frame are cut from 3/16-in. x ½-in. spruce, tapered to about 3/16 in. x ¼ in. in the ends. Braces of light piano wire hold the main sticks 4 in. apart. These braces are formed (as shown on drawing) at one end for the propeller bearing and at the rear of the machine for the hooks for rubber. Two intermediate braces of spruce or bamboo are placed between the main sticks at regular intervals and the frame guyed with light steel wire. The bearings project 2 in. beyond the frame at each side, making a total distance of 8 in. between bearings. The bearing for propeller is but a piece of brass tube soldered along the piano wire braces. Care should be taken that the bearing is in line with the hooks for rubber at the rear of the machine. The brace at rear of the frame is arranged to permit the hooks for rubber to project 1 in. beyond the frame at each side, making a total distance of 6 in. between the hooks. The span of the main planes is 24 in. and the chord 5 in., except at the center, where it is 4 in. (shown on drawing). Both spars and ribs are of bamboo. Curved and rear edges of planes may be made with light piano wire. It is desirable to use heavy bamboo paper coated with varnish for the wing covering. Eight struts, each 4½ in. in length, are employed between the planes; these are cut streamline, from 3/32-in. x ¼-in. spruce, tapering from the middle along the rear edge down to about 3/32 in. round at the ends. Four struts are placed between the planes immediately over the main frame and two struts 6 in. from these at each side. Light steel wire is guyed between the struts.

Rear Plane.—This plane or tail is flat; greatest length, 12 in.; width of center, 4 in.; bamboo ribs, 2 in. apart. A fin or rudder of aluminum is attached to the tail, as shown in the drawing.

Pontoons.—The method of pontoon construction is original with this constructor, the pontoons being constructed as follows: These pontoons are made from cardboard (about the thickness of an ordinary business card) to the shape shown, and dimensions given, and cement the parts together with ambroid. Cardboard pontoons keep their shape and are not as heavy as one may imagine and it is possible to form the cardboard into all sorts of shapes not possible by other means of construction. Model builders attach too much importance on having pontoons as light as possible, not taking into consideration the loss of efficiency when the pontoons are warped out of shape, and not considering the damaging effect on the pontoons when a hard landing is sometimes made on the earth. The cardboard pontoons were designed to eliminate as far as possible these defects. Three pontoons of same size are used, two at forward end of machine and one at the rear, below the tail. Greatest depth of pontoon, 1⅜ in.; greatest length, 4½ in.; uniform width, 1½ in. A coat of varnish will make them waterproof and another coat of aluminum paint will improve the appearance. Two aluminum tubes, 1/16 in., 1¾ in. long, are run through the top of each of the pontoons for attachment to the frame. Where the tubes enter the pontoons, ambroid will keep out the water. Light piano wire is used for bracing and attaching the pontoons. Solder is used to connect the wires. Attachment is made to pontoons by running the wire through the aluminum tubes.

Rubber.—Fifty feet of flat rubber is used, divided into 10 strands on each side, each 2½ ft. long. Depending on material used, which regulates the weight of the machine, it may be found less rubber than this will do.

Propellers.—Two 8-in. propelers are used. Carved or bent wood. These are attached to bearings, so that in case of breakage they can be easily replaced. Keep plenty of oil on the bearings, etc., to prevent the rust.

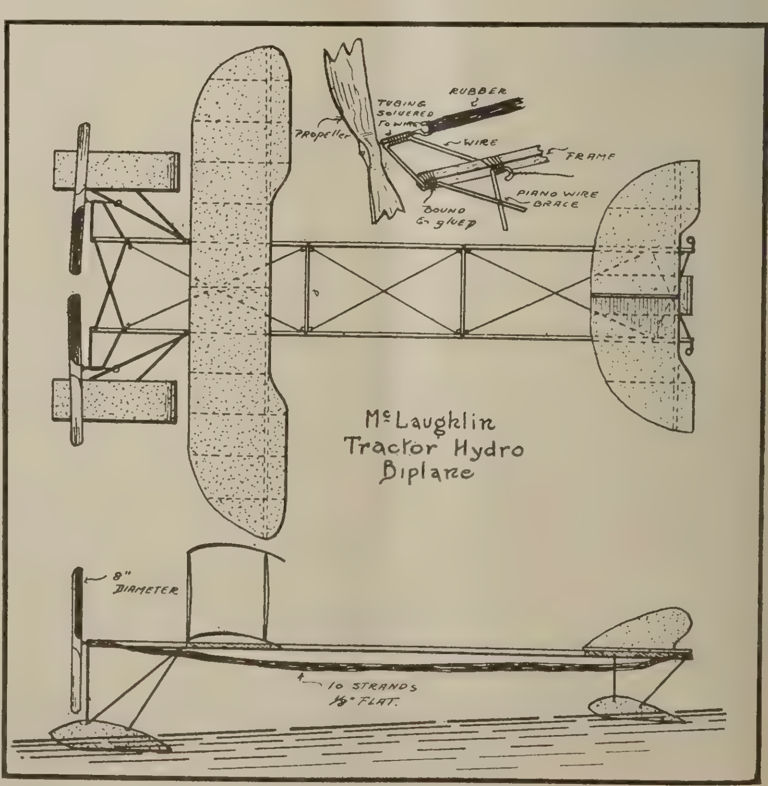
Aero Science Club of America

At the coming meeting the Aero Science Club of America will have an election of officers for the coming year. This will mark the beginning of the third year for the club. During the past year the membership of the club was increased over 100 per cent, not including the membership of the affiliated clubs, and the indications are that during the ensuing year the membership of the club will be increased to double that of the past two years. Already a number of the members are actively engaged in instructing the members of other clubs in the vicinity of New York so that they may be enabled to enter the coming National Model Aeroplane Competition. Other members of the club are busy preparing models of the rubber strand, compressed air and gasoline driven type, which they themselves will enter in the coming competitions. Word was received at the last meeting concerning the formation of the following clubs:

The Youngstown Model Aero Club, Youngstown, Ohio.

The Denver Model Aero Club, 2820 Raleigh Street, Denver, Colo. Mr. R. H. Pearson, Director.

Secretary, 29 West 39th Street, New York City.



McLaughlin Tractor Hydro Biplane

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Flights of Fancy

Eight little aeroplanes
  At the front had we;
Five of them couldn't fly,
  Then there were three.

Three little aeroplanes,
  Pitifully few;
One met a gust of wind,
  Then there were two.

Two little aeroplanes
  Soaring toward the sun,
Both of them disappeared,
  Then there were none.

N. H.

Needless Extravagance

"No, my 'usband ain't killed, Mrs. Marks. No sooner did I put all the kids in mournin', even to biby in the pram, when I gets a telegram a'sayin' 'e's alive and well. Yes, an' all this expense for nothin'."

"Wot a crool shame!"—*Passing Show.*

Out of the State

A disheveled citizen rushed into a Boston police station and shouted for vengeance.

"The aeroplane that dropped grease on me five minutes ago was No. 41144," he spluttered.

"I can prove that he was violating the law on flying over the city, and I want—I want——"

"You want a warrant for his arrest?"

"Warrant nothing! What good would a warrant do me at the rate he was going? I want extradition papers."

French Diplomacy

A story is told of an American aviator traveling in Europe.

While in Paris he went into a jeweler's shop and asked the price of a pin on the counter. He was told it was twenty francs.

"That's too much," said the tourist; "it's a present for my sister. I'll give you five francs for it."

"Zen it would be I zat gave ze present to your sister," said the Frenchman, with a deprecatory shrug, "and I know not ze young mademoiselle."

Would Obey Orders

An aeroplane factory was in course of construction.

One day the foreman swore at Cassidy for not fully loading up his hod. The hod, he said, would hold so many bricks, and Cassidy must take a full load up the ladder every trip.

One morning the supply of bricks ran out, and Cassidy, after gathering every brick in sight, found he was still short of the proper number. He yelled up to a workman on the fifth story.

"What do you want?" asked the workman.

"Throw me down wan brick," shouted Cassidy, "to make good me load."

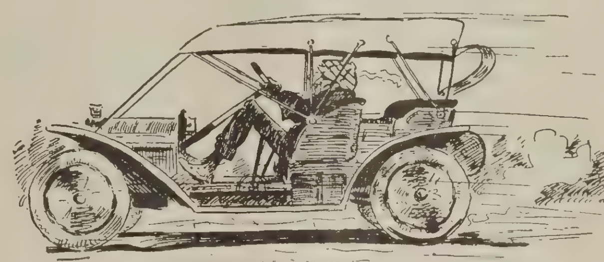
She—This looks like a foreign letter from the front.

He—Turn it over, dear, and see what it looks like from the back.

Aeroplane Wanted

Good Samaritan—My dear man, have you vertigo?

He With the Lamppost—Yesh, indeed, sir—way up on the heights.



1. "She moves."

2. "She rises."

3. "She sails."

Broadway Aeroplane Salesroom

The General Aeronautic Co., of 110 West Fortieth street, of which Mr. R. K. Mickey is president, has made an arrangement with the Duffy Motors Corporation, 1895 Broadway, whereby this company will become the metropolitan distributors of the General Aeronautic Aeroplanes, and agents for their school. An aeroplane will be on exhibition at the salesrooms regularly.

Progress of Harvard Flying Corps

Plans are rapidly advancing for the establishment of an aviation camp by the Harvard Flying Corps, and the training of 100 aviators. The camp will be under the supervision of Frazier Curtis, Harvard '98, who recently was invalided home by the French War office after sustaining serious injuries in the French military service. Mr. Curtis has outlined a course following that at Pau, France, where he flew for a military brevet.

He learned to operate an aeroplane at Marblehead, Massachusetts, where his brother, Greely S. Curtis, is a member of the Burgess Company. Members of the Harvard clubs of Boston and New York have promised financial aid to the movement, and the question of a site is now being discussed, a location near Boston being desired, if a suitable tract can be found.

A room for headquarters has been secured at Cambridge, and furnished with a large number of works on the theory and practice of aviation, including studies of military flying. The co-operation of the War Department has been asked, with the loan of an army officer to direct the immediate training.

The committee in charge includes Mr. Curtis, H. H. Metcalf, '17, and W. H. Meeker, '17. In setting forth the plans of the organization, Mr. Curtis points out the weakness of American Aerial defense, as shown in the recent events in Mexico. Today there are less than a score of pilots in the United States army. This fact, he said, would show the importance to the nation of the fulfillment of the Harvard Flying Corps' plan for making immediately available a total of 100 qualified military flyers.

The constitution of the Corps, after stating that the object is to build up a United States aviation organization to compare in size and efficiency with that of France (which has 2,200 pilots trained or training), goes on to outline the plans for bringing about this result.

The co-operation of several flying concerns has already been secured, among them that of the Burgess Company, which during the coming Spring is expecting to train fully a dozen Harvard men, including graduates and undergraduates.

Export of Aeroplanes

During the last week the exports of aeroplanes from the port of New York totaled $102,119, and of this amount $102,060 went to England and $59 to the British West Indies.

Navy Balloon Drifts 100 Miles Without Crew

An observation balloon at the Navy Aeronautic Station, Pensacola, broke from its moorings April 7 and floated away unoccupied, subsequently descending at Argyle, Fla., about a hundred miles from Pensacola.

Press reports stated that it was the new Navy dirigible, the DN-1, described in the last issue of AERIAL AGE, that had escaped, but this was denied in a statement from the office of the Secretary of the Navy. The new dirigible is still at the plant of the Connecticut Aircraft Co., New Haven, awaiting the completion of the hangar and the installation of the hydrogen plant at Pensacola.

Thaw Bags German Aero

William Thaw, of Pittsburgh, one of the American volunteer aviators with the French army, who was sent to Verdun at his own request a fortnight ago, has succeeded in bringing down a German aeroplane.

Thaw was in the air an average of seven hours daily for eleven days and made five flights in two days. On his last day out he shot down a German machine which, however, dropped beyond the German lines. He sighted another enemy aeroplane, but having exhausted his machine gun ammunition he was unable to give chase.

Thaw says the air around Verdun is constantly filled with French aeroplanes.

The Mexican Situation

As reported in our last issue, The Aero Club of America, in a letter signed by the president, Mr. Alan R. Hawley, offered to the War Department two aeroplanes at a nominal cost of $1.00 each, this price being placed upon them in order to overcome the law making it impossible for the War Department to accept them as gifts.

Hon. Newton D. Baker, Secretary of War, has written the following letter to Mr. Hawley, regarding this offer:

My Dear Mr. Hawley:

I have the honor to acknowledge the receipt of your very courteous letter of the 24th ult., in which you offer the services of the Aero Club of America in connection with the punitive expedition of United States forces into Mexico; express the willingness of the governors of your organization to donate two aeroplanes to the Army, and suggest the advisability of employing the civilian and militia aviators now being trained at the expense of the National Aeroplane Fund.

The Department is fully appreciative of your kind offer, but as you are probably aware, Congress has appropriated the sum of $500,000 for aviation purposes, which makes it unnecessary at the present time to take advantage of your kindness. Orders for additional aeroplanes have already been placed, and the purchase of other machines is contemplated.

In view of the lively interest already shown by the Aero Club of America in the aviation service of the Army, I feel that it would be unnecessary for me to express the hope that you and your organization will continue your efforts to increase and improve this branch of the service, which has become so very important in modern warfare. Your continued co-operation in this matter is solicited, and it is hoped that in due time we shall have an aviation service in the Army that will be commensurate with our standing as a nation.

Thanking you cordially for your courtesy in the premises and expressing the hope that you will convey to the governors of your Club the gratitude of the Department for the patriotic offer of its service, I remain, Very sincerely yours,

Newton D. Baker,
Secretary of War.

The work which the first Aero Squadron has been able to accomplish, according to press dispatches, even with their inefficient equipment, has been of such a nature that headquarter officials are anxiously waiting reinforcements of this arm of the service. General Pershing's reports indicate that the five still in service are doing good work both in scouting and carrying dispatches. It has been due to them that General Pershing has been able to keep in communication at all with the fast moving cavalry detachments. The wireless has been undependable since the expedition started, hence the flying machine, out of date as are those in the possession of the Army, has been the eyes and ears of the Army virtually in every important matter since Mexico was entered.

Trips are made daily from Nueva Casas Grandes to Columbus, and the journey of 110 miles, is made in two hours.

The descendants of the famous Darius Green who operated them may make a "bubble" once in a while, but not often enough to make it tiresome, and when they are told at Cusihuiriachic, for instance, to go to headquarters at Nueva Casas Grandes with a handful of envelopes filled with orders or news items to be wirelessed or aeroplaned on the States, the orders and the news items are at their destination two and a half hours later. That is "going some," but that kind of going cannot always be depended upon, especially when adverse winds are blowing. But in the main the fliers will cover ground in a manner to make all other forms of communication look slow.

On April 7 two aeroplanes were dispatched from General Pershing's headquarters to Chihuahua City, manned by Captains Foulois and Dodd and Lieuts. d'Argue and Carboy.

Statement of the Ownership, Management, Circulation, etc., required by the Act of August 24, 1912, of Aerial Age Weekly, published weekly at New York, N. Y., for April 1, 1916. Editor, G. Douglas Wardrop, 116 West 32nd St., New York; Managing Editor, G. Douglas Wardrop, 116 West 32nd St., New York: Business Manager, G. Douglas Wardrop, 116 West 32nd St., New York; G. A. Cavanagh, Assistant Business Manager, 116 West 32nd St., New York; Publishers, Aerial Age Co., Inc; Owners, Aerial Age Co., Inc.—Henry Woodhouse, 297 Madison Ave., New York; W. D. Moffat, 119 West 31st St., New York; W. I. Seaman, 20 Exchange Place, New York; J. H. Coit, 120 West 32nd St., New York; L. D. Gardner, 120 West 32nd St., New York; G. D. Wardrop, 120 West 32nd St., New York. Known bondholders, mortgagees, and other security holders, holding 1 per cent or more of total amount of bonds, mortgages, or other securities: None.

Sworn to and subscribed before me this 1st day of April, 1916.

G. Douglas Wardrop, Business Manager.

Elise Gilman,

Notary Public, Westchester County.

(Seal.)

Certificate filed in New York County. No. 7197. New York Register Number, No. 221.

(My commission expires March 30, 1917.)

Effort to Bring U. S. Aviation Training Camp to Chicago

Mr. Charles Dickinson, president of the Aero Club of Illinois, and Mr. James S. Stevens, vice-president, have offered the United States Government the use of the club's new flying field for use as a mid-western aviation training station. The field, one of the best in the country, covers an expanse of 640 acres just inside the limits of Chicago, and already contains fifteen hangars in process of erection.

Mr. Alan R. Hawley, president of the Aero Club of America, together with Mr. A. B. Lambert, president of the Aero Club of St. Louis, go to Chicago to help boost the local club's interests.

Telegrams were sent by the Aero Club of Illinois to Senators Sherman and Lewis, and to Congressmen Madden and Mann. Mr. Lambert has also sent a telegram stating the desirableness of having such a field in Chicago to Senator Stone, of Missouri. Indications are that Chicago will be selected in the immediate future as the army's Central States aviation training station. The telegrams as sent by the Aero Club of Illinois to Washington follows:

"The most important thing lacking in the regular army, and especially as applied to the militia, is an adequate equipment of aeroplanes and aviators. If we have trouble on a large scale in Mexico this branch of the military service will prove the most valuable, and without which our troops will be seriously handicapped. Can you not introduce into Congress a bill at once authorizing an appropriation of $100,000 for the purpose of mobilizing the civilian fliers at one given point, not only for the mobilization of the aviators, but for the assembling of material and supplies? This will permit a more efficient organization which the signal corps can absorb and distribute to the militia troops.

At present only two States have avation detachments. The legislative bodies of most States are not in session and nothing can be done along these lines by the individual States to equip their respective troops. That is our predicament here. There should be an aeroplane for every 200 men sent to Mexico. The Aero Club of Illinois now offers to the government the free use of land recently purchased for buildings, located in the center of a 640-acre tract without a fence, building or tree thereon within the city limits of Chicago. This 640 acres is available under the ownership, leases and privileges held by the Aero Club of Illinois. This square mile of land is near the tract used in 1912 for the international Gordon Bennett races and was considered by aviators of Europe who used it the finest flying field in the world."

Messrs. Hawley and Lambert point out that Chicago's facilities for such a station are ideal; further, that Chicago, too, has excellent hydro facilities and that the station need not be confined to land machines alone. At this time, when the questions of war and preparedness are shaking the country, Mr. Dickinson's offer to make easy the establishment of a central flying camp ought certainly to bring immediate and long-hoped-for results.

Aeroplane for West Va. National Guard

Adjutant-General Bond announced today that he expects to begin work next week in an effort to secure a subscription of $9,000, to which Godfrey L. Cabot has agreed to add $1,000 as a fund to purchase an aeroplane for the West Virginia National Guard. Free instruction for at least one officer of the guard would be provided by the aeroplane company selling the machine.

Equipment for the National Guard of Oregon

Capt. Frank W. Wright, commanding the Eighth Company, Coast Artillery, stationed at Portland, Oregon, and Louis T. Barin, now in charge of the Aviation Corps of the Oregon Naval Militia, with the rank of chief mechanician, have received their orders to take a course of aviation in the Aviation School at San Diego, Cal.

The expenses of Captain Wright will be paid by the Aero Club of America, which made a proposal to the National Guard some time ago, offering to send one man from the State to the Aviation School. Aviator Barin's tuition will be furnished by the Curtiss Aeroplane Company.

Neither the Naval Militia nor the National Guard of this State possesses any aeronautical equipment at present. The former branch of national defense had the use of Mr. Barin's aeroplane, but that machine lately developed serious motor trouble and can not now be used. Those who are interested in the development of aeronautics in the Northwest are encouraged, however, by a statement made by Gove Withycombe. He said that if the Guard had trained men who could handle flying machines, the equipment would probably come later.

Captain Wright will probably remain at the school for six weeks. Mr. Barin, however, who is an experienced aviator, and has made numerous flights, will only remain sufficient time to obtain a pilot's certificate.

AERIAL AGE WEEKLY

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Flying Corps to Be Separated from the Signal Corps?

THE reorganization of the Army Aviation Service was begun last week when Secretary of War Baker announced that Brig.-Gen. George B. Scriven, Chief of the Army Signal Corps, had been censured and Lieut.-Col. Samuel Reber had been censured and relieved of his post as Chief of the Army Aviation Section as a result of charges growing out of the court-martial of Lieut.-Col. Lewis E. Goodier, Judge Advocate of the Western Department.

Secretary Baker issued the following announcement:

"The questions growing out of the Aviation School and the discipline of the Aviation Corps have all been reviewed by a board of officers of the army, consisting of General E. A. Garlington, Inspector General; General M. M. Macomb, President of the Army War College, and General H. P. McCain, the Adjutant General. In addition to the evidence taken by them I have had the testimony in the court-martial case of Lieut.-Col. Goodier, and have followed the work now being done by the Aviation Section in Mexico.

"It is clear that at least a part of the criticism which has attached to army aviation is due to a failure to realize the experimental state of the art of flying heavier-than-air machines adapted to military uses. As yet the development of a stable type is uncertain, and the supposed failures of some of our army machines are not greater than failures experienced by inventors, manufacturers, and pilots in civil life.

"The net result of the work so far done in aviation in the army can be safely said to be the building up of a corps of daring, skillful, and successful fliers, and the work now being done by the aviation section in Mexico demonstrates the usefulness of this arm and the zeal that has been expended on its organization and instruction.

"Restlessness and impatience on the part of some of the men in the corps with the slowness of the progress made is not an unnatural result of their zeal and their youth. That those higher officers, responsible for the development of the corps, allowed their entire effort to be devoted to the work of aviation and overlooked important administrative details has resulted in recommendations of censure which I have approved and carried out. These censures, however, deal with failures to enforce and maintain discipline and to observe legal restraints and military regulations. They do not disclose in any officer of the army an unworthy motive.

"The president has approved the finding of the court-martial and has censured Lieut.-Col. Goodier, who is the Judge Advocate of the Western Department, for his failure to observe the attitude which his office and seniority of rank required him to observe toward junior officers. Pursuant to the findings of the board of inquiry the Secretary of War has censured General Scriven for his failure personally to supervise the disciplinary features of aviation corps administration; Lieut.-Col. Samuel Reber for disrespect to a co-ordinate branch of the Government, failure to observe the restraints imposed by law with regard to the personnel and pay of members of the aviation section, for lack of business method with regard to the property of the Government in discarded machines, and for failing in that degree of loyalty to his superior officer which would have saved both General Scriven and himself from the censures now involved and this branch of the service from the public doubt and criticism which has affected it unfavorably.

"Pursuant to the recommendations of the board, the Secretary of War has requested the chief of the General Staff to appoint a committee to study the whole question of management and discipline of the aviation school and the relation of the aviation corps to the general army organization. Colonel Reber has been relieved from duty in connection with the aviation section. Temporarily Captain Mitchell, of the General Staff, will perform his duties, and the reorganization of that section will await the recommendations of the General Staff committee above referred to. Certain questions arising out of the drawing of flight pay by members of the aviation school remain to be disposed of, but they must wait until certain legal questions have been determined by the Controller, to whom they have been referred."

The creation of a separate corps for aviation, distinct from the Signal Corps, as forecast by Secretary Baker in his statement, has had our hearty endorsement for a long period.

In an editorial of our May 31st, 1915, issue we said:

"As we have already said, it is regrettable to have to take the aeronautical division from those who nursed it, as it were, from babyhood (the Signal Corps). But the welfare of the Service demands it. Congress has shown that it will not allow more to the aeronautical division than it allows for the rest of the Signal Corps—and that is not enough, is only a fraction of what is needed. Therefore the separation must come.

"Among the consoling features are the fact that it is for the good of the service, and that the officers who have charge of it now will probably be in charge when it becomes an independent bureau. The first will suffice an officer. Incidentally, for the good of the service recently New Yorkers refused to indorse the proposition to establish a government aircraft factory in New York. They would have liked very much to have it, but for the good of the service they opposed the motion."

If such a separate aviation corps is secured it will pave the way to the addition of battle aircraft to the scouting and message-bearing aeroplanes now used.

Putting Advertising Back of Defense

THE Associated Advertising Clubs of the World, with the full authority of President Wilson and the Secretary of the Navy, have placed their entire organization behind the plans of the Committee on Industrial Preparedness of the Naval Consulting Board.

In last week's issue of AERIAL AGE we had the pleasure of presenting for the consideration of our readers the first piece of copy issued in this campaign, and throughout its progress the campaign for "National Defense and International Peace" will have our heartiest endorsement and co-operation.

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

Mr. Herbert S. Houston, chairman of the Committee on Industrial Preparedness, expressed the purposes of the committee as follows:

"Through the great power of advertising we expect to arouse manufacturers, workingmen, business men—in fact, the whole country—to the vital need of making industry the basic line of defense, so that, if necessity arises, it can supply munitions quickly and abundantly.

"This is not a war measure, but a peace measure. We have adopted as the slogan of the advertising campaign 'National Defense and International Peace.' Publishers of leading newspapers, magazines and farm papers, poster men and electric sign men, trade paper publishers and others representing the different advertising interests, have already offered space to carry the advertising, without cost to the Government. They are glad to strike hands with the engineers, in the same patriotic and unselfish spirit they are manifesting, and co-operate with them in this broad undertaking.

"We are enlisting the services of the most distinguished illustrators in the country, of the best copywriters and engravers, and it is our purpose to have a campaign of advertising that shall be commensurate in quality and power with the great national task which the Government has asked us to join the engineers in undertaking.

"W. C. D'Arcy, president of the D'Arcy Advertising Agency of St. Louis, the chairman of our National Advertising Committee, and Lafayette Young, Jr., publisher of the Des Moines *Capital*, the chairman of our National Defense Committee, will share with me the general direction of the campaign."

Flying Over the Atlantic

[Editorial in New York *Press*.]

THE time is at hand when it may be expected that almost any day will bring the announcement that somebody has flown across the Atlantic Ocean. Since the war broke out progress well-nigh unbelievable has been made in the construction and also in handling of aircraft.

Originally the greatest problem was to make men learn the "feel" of flying; to give them the "hang of the thing;" to make them sense the possibilities of air support and resistance; to give them confidence in the stability of the seemingly unstable element on which flight depended. The first contribution of the Wrights to the art of flying was made before they had perfected an engine; when they were still experimenting with their first biplanes on the sand dunes of Kitty Hawk; coasting in the air, it might be called.

The war has changed all this. Today there are thousands of men who know the art of flying; who handle a set of wings and an engine with the same confidence and nonchalance as another man toys at the wheel and gears of a motor car. They "know the air" as a driver knows a familiar road. They are as native to this formerly unknown element as a hawk or a condor.

Along with this development of an army of men who know the art of flying and the lanes of the air there has been marvelous advance in mechanical construction of heavier-than-air machines. They are constructed with duplicate engines, so that if one goes out of commission it does not become necessary to lose all power and descend. Their stability has been vastly increased, like size and lifting power. Much of the progress in these mechanical directions has been concealed from the outside world by the aircraft builders of the warring countries; but much, also, is well understood.

Several projects for flying across the Atlantic are now under discussion. Two years ago the Rodman Wanamaker enterprise was much in the public attention, but the war's coming distracted all thought from it. Now a flying machine with 1,000 horsepower, capable of 100 miles an hour, and easily able to remain aloft for a day and a half, is being constructed in Massachusetts. War conditions, rather than anything else, will determine when it shall undertake the trip across the ocean.

A Machine of Twenty-five-Ton Weight

(*Editorial in the Army & Navy Journal*)

Capt. Mark L. Bristol, U. S. N., in charge of naval aviation, is undoubtedly correct in his belief that the art of flying is only in its infancy, wonderful as its progress has been in the past few years. Under the stimulus of military necessity it is making rapid progress, and one of the garnered fruits of war will be the mastery of the air, as we have mastered the ocean. A machine of 50,000 pounds weight is in the vision of Captain Bristol, and from abroad comes already the report of aeroplanes with 1,000 horsepower. Captain Bristol advises that aircraft be treated as a new type of warship and handled by officers detailed for such duty, and not by a flying corps of civilians. He would have a reserve of trained officers and men supplemented by an organization of manufacturers and material producers. A mobile fleet of eighty-two aeroplanes, five dirigibles and forty-one balloons should be immediately provided at a cost of $13,670,000, with a personnel of 430 officers and 852 men, to meet present requirements, to be ultimately increased to 638 officers and 1,200 men. As officers are already instructed in battleship duty, Captain Bristol believes that preference should be given, over other branches, to the service now known by the name of "aviation" and which he would call aeronautics. There are now nearly ready for delivery one dirigible, twenty-three aeroplanes, sixty-four motors and twelve competitive motors. Manufacturers are showing a gratifying spirit of patriotic desire to aid the Government in this matter, the profit not being sufficient to tempt them. Captain Bristol recommends for use on battleships dirigibles, the type experience is showing to be the most effective, being a better distance flyer than the aeroplane and having greater carrying capacity. The balloon types are useful for observation. It is expected that officers will soon be ordered to aviation duty.

An Aviator a Day and Free Scholarships

THE Philadelphia School of Aviation, which will open in that city on May 1 will, if the expectations of the group of capitalists who have promoted the project are realized, eventually have free scholarships and be able to turn out an aviator a day.

The work of the school will not, however, stop with the training of men in aviation, but, as the plans are developed, the gentlemen in charge will give attention to suitable employment for the graduates, and as the carrying of mail between towns presents a field of almost unlimited possibilities it is in that direction that the promoters hope to be able to assist the aviators in securing lucrative employment. Between many cities large sums are annually paid to contractors to carry the mail by circuitous routes. With aeroplanes the mail can be delivered without loss of time, and, in many instances, it is expected that the aviator could underbid any figures possible for land or water carrying.

The patriotic citizens who have undertaken to relieve the needs of the United States for experienced aviators, have not only subscribed the $25,000 needed to establish the Philadelphia School of Aviation, but have drafted plans and specifications for hangars, contracts for their construction, sub-contracts for material and flying machines, and even have provided for the employment of experienced instructors.

This is the spirit of patriotic determination behind the Philadelphia School of Aviation. It is the spirit of Robert E. Glendinning, the wealthy banker, clubman and amateur aviator, who has overcome four years of handicaps, discouragements, red tape and lack of appreciation, until the European war demonstrated his foresight and rallied other people to his support.

Mr. Glendinning now is able to guarantee that for every $400 subscribed, this country will get an experienced aviator. By applying business methods, the Philadelphia School of Aviation expects to reduce this cost of educating an aviator.

The school will spread practical knowledge of aviation, and turn out as many experienced pilots as possible. It will appeal to young men who can afford it, to pay for their tuition at cost, so that other revenue may be devoted to teaching young men who cannot afford to pay.

Alexander Van Rensselaer, Judge J. Willis Martin and Anthony J. Drexel Biddle have become enthusiastic supporters of Mr. Glendinning's aviation preparedness plans.

When Mr. Glendinning first became impressed with the fact that other countries were making more rapid progress in aeronautics than this country, he met with strenuous opposition to his plans for adding aeronautics to the list of American sports.

To test his theory that aeronautics could be undertaken without great risks, Mr. Glendinning then began to practice it. There were times four years ago when a balloon occasionally was seen to float over Philadelphia without anybody knowing the identity of the occupants. The unknown passenger on these balloon trips was generally Robert E. Glendinning.

On trips to France, Mr. Glendinning found better opportunity for studying aeronautics by taking balloon trips, and he even won long distance trophies, but without notoriety.

Convinced of the superiority of heavier-than-air machines, Mr. Glendinning changed to the new machine. He went to Hammondsport, N. Y., for six weeks, taking a full course in the Curtiss school and obtaining his graduation diploma entitling him to fly. Then he won a full international pilot's license, and a French aviation license, which carries with it a certificate recommendng him as qualified to all civil and military authorities.

With his associates in this patriotic purpose, Mr. Glendinning raised the $25,000 necessary to obtain aeroplanes, hangars, a repair shop and instructors. When the school opens it will have two machines, in addition to Mr. Glendinning's private machine. Already there are a number of applicants for enrollment. As the school is not a money-making enterprise, but an institution for public benefit, the growth of the school will be limited only by the financial support it receives from persons who can afford to pay for the education of one or more aviators.

The News of the Week

100,000 Miles in 14 Months

United States military airmen at North Island have covered a distance approximately four times around the globe in training flights from January 1, 1915, to February 29, 1916, according to War Department statistics.

Five Martin military tractors and two Curtiss flying boats were used in flying this distance.

A remarkable feature of the fourteen months of instruction flying is that not one fatal accident occurred.

The total number of flights made by the seven land training machines and flying boats during the fourteen months was 3,386. The number of flights and duration of each machine used for training purposes at the North Island military aerodrome since January 1, 1915, exclusive of the flights by Lieut. Thomas De Witt Milling in the Burgess-Dunne, follows:

No. 31, Martin tractor: Number of flights 450; total time aloft 214 hours 15 minutes.

No. 37, Martin tractor: Number of flights 534; total time aloft 239 hours 44 minutes.

No. 38, Martin tractor: Number of flights 824; total time aloft 425 hours 33 minutes.

No. 49, Curtiss flying boat: Number of flights 125; total time aloft 51 hours 28 minutes.

No. 50, Martin tractor: Number of flights 524; total time aloft 197 hours 30 minutes.

No. 51, Martin tractor: Number of flights 358; total time aloft 290 hours 41 minutes.

No. 34, Curtiss flying boat: Number of flights 584; total time aloft 264 hours 27 minutes.

During the first two months of 1916 these seven machines made 570 training flights with a duration of 257 hours 25 minutes. The distance covered in these flights was approximately 21,560 miles.

A comparison of the training methods employed in Europe for army aviation students with that of the methods used at North Island shows that the United States has nothing to learn to advantage from European aviation instructors.

Army aviators declare that the training machines used at North Island are unsurpassed for this particular class of aviation work. In France the apprentice airmen is put on a Penguin No. 1, which is not a real flying machine, the wings having been clipped to such an extent that the machine will not get off the ground. With this, which is equipped with a 25-horse-power Anzani motor, the novice runs around the field until he can maneuver his craft perfectly. He then begins "grass cutting" with a Penguin No. 2, and after graduating from this goes to Penguin No. 3, on which he receives final flying instructions.

At North Island the student receives instruction from skilled instructors while flying in altitudes varying from 200 to 500 feet, the dual control enabling the instructor to always retain control no matter how hard the novice tries to upset the plane through inexperience.

National Advisory Committee Reports

The first national report of the National Advisory Committee for Aeronautics has just been issued from the Government printing works and contains one of the most valuable collections of original contributions on the many phases of aeronautics which have yet been produced in this country.

In addition to a full discussion of the activities of the Committee, the volumes contain reports on the experiments carried out at the Massachusetts Institute of Technology; the Investigations of Pitot Tubes, by the United States Bureau of Standards; Investigations of Aviation Wires and Cables, by John A. Roebling Sons Company; Report on the Problem of the Atmosphere in relation to Aeronautics, by Charles F. Marvin. A report on the Relative Worth of Improved Fabrics, by the Goodyear Tire and Rubber Co.; a Report on the Investigation of Balloon and Aeroplane Fabrics by the United States Rubber Company, and a most exhaustive treatment of Thermo Dynamic Efficiency of Present Types of Internal Combustion Engines for Air Craft, by Columbia University.

We hope to present to our readers from time to time excerpts from the several reports.

Dutch Purchasing Committee Arrives

Lieut. Vogelensang arrived at San Francisco on Friday of last week to purchase a further number of the Model S Martin seaplanes, similar to those already delivered to the Dutch West Indies. Lieut. der Poorten will arrive in about a week's time when delivery of the machines will be made. Within the next few days six machines of the same type will be shipped to Holland. All of the machines bought by the Dutch authorities are equipped with the Hall-Scott 125 h.p. motor.

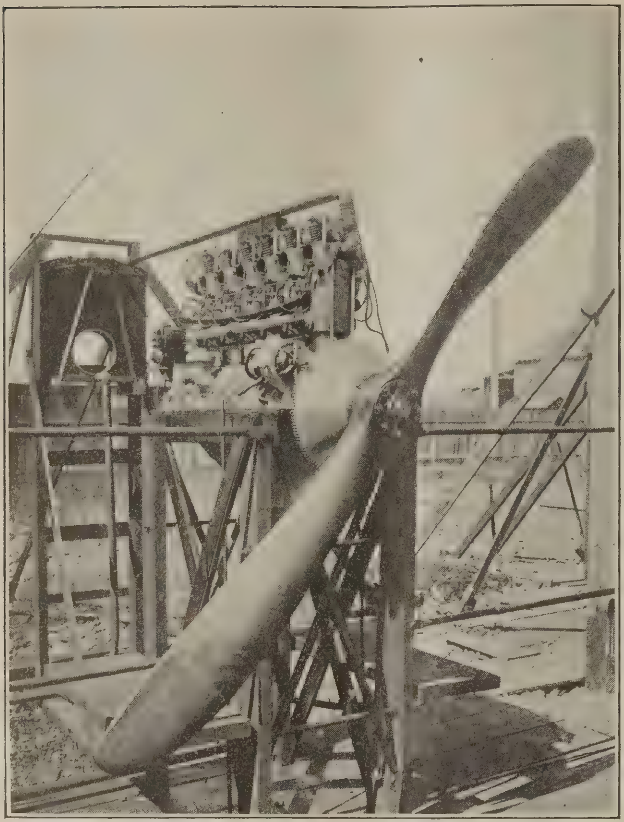
Export of Aeroplanes

During the week of April 10 exports of aeroplanes and parts to Great Britain totalled $194,122.

Charles Niles in Manila

After completing a very successful tour of Japan, Charles Niles has left for Manila to fulfil a six weeks' engagement. After fulfilling this engagement Mr. Niles will probably return to Japan to carry out his long distance flight between Osaka and Tokyo.

Instructors at the Atlantic Coast Aeronautic Station training school. Left to Right: Bert Acosta, Victor Vernon, Victor Carlstrom, Capt. T. S. Baldwin, Manager; Steve Mac Gordon, T. R. Macaulay; extreme right end, Cogswell



The A-5 Hall-Scott 125 H.P. motor, equipped with a number of special features, and built for Mr. Caleb Bragg, the well-known automobile racer, who expects to install this equipment in a Martin seaplane, described elsewhere in this issue. Among the special features are Bosch electric starter—the starter, generator and battery weighing only 88 pounds

Harvard Aviators Cannot Have U. S. A. Instructor

The Harvard Flying Corps has been refused a United States Army aviator as an instructor. Captain George G. Gibbs, of the United States Signal Corps, in a letter to Commander Frazier Curtis, '98, explains that Congress must act before the War Department can help the Harvard aviators in their flying. He praises the purpose of the corps.

Curtiss Offer Accepted

The War Department has accepted an offer of the Curtiss Aeroplane interests tendering the use of their testing grounds at Newport News for testing the eight new biplanes recently purchased for Mexican service.

Maine Aero Coast Patrol Incorporated

The Maine Aeronautical Coast Patrol Association, which was organized April 3 in the office of the Portland Chamber of Commerce, has been incorporated and papers of incorporation filed in the Cumberland County Registry of Deeds. The authorized capital is $10,000, and the shares have a par value of $10 each. Rear Admiral Robert E. Peary, retired, of South Harpswell, is president; W. B. Moore, Portland, treasurer and clerk, and Admiral Peary, George L. Crosman, Reuben K. Dyer and Elias Thomas, of Portland are directors.

Colonel Squier to Go to North Island

Major General Scott, chief of staff, has announced that Lieutenant Colonel Squier, upon his return to this country from London, will be sent to command the aviation school at San Diego.

Colonel William A. Glassford is now temporarily commanding the school. According to gossip among Army men, Colonel Squier is slated eventually for the position of chief of the aviation section, now held by Lieutenant Colonel Samuel Reber. General Scott said the only thing decided thus far was that Colonel Squier will be placed in charge of the San Diego school. He would not discuss probable changes in the personnel of the aviation headquarters in Washington until the Army Board's report is passed upon by Secretary Baker.

The Aviation Board, recently appointed, is composed of Captain Virginius Clark, Lieutenant Thomas De Witt Milling and Lieutenant Byron Q. Jones. Clark is a technical expert. Milling and Jones are two of the foremost Army fliers, the former having made a thousand successful flights.

At the outset, the Board has recommended new legislation to pave the way for the enlistment of civilian fliers in the aero service. The Board will inspect the eight new machines recently purchased for use in Mexico to see that they come up to requirements. The Board will also determine responsibility for the present situation in the aviation branch and find out why only two out of the eight aeroplanes in Mexico are capable of continuous use.

Lieutenant Colonel Squier is not unknown in Washington, for he was assigned to the Signal Corps office in the War Department for several years.

He was the first United States Army officer to make a distance flight in a heavier-than-air flying machine.

In the summer of 1909 he was Orville Wright's passenger on the trip from Fort Myer to Alexandria which the Government required as a test of the aeroplane.

Lieutenant Colonel Squier, then a major, conducted the Government tests, studied aviation closely, and made many flights with Orville Wright, in several instances remaining aloft five and six hours. He also made a number of flights in the Curtiss-Baldwin dirigible balloon, tried out at Fort Meyer in 1909, during his study of aeronautics.

Aviation in Dallas

Dallas, Texas, is in the throes of the new and decidedly infectious disease—"aeronitis"—according to the Dallas *Chronicle*. It is promised that it will soon be the civilian aviation center of the South.

There are now at least thirty-five "aeronauts" there and not

Test of the last of a lot of twenty-five Gyro motors just delivered. Inspecting officer witnessed the test of each motor. All put through a four hours' non-stop run

less than fourteen aeroplanes. These machines range from the man carrying "glider" type to the full-fledged "battle-plane," now in use in the war zone of Europe. All were made in Dallas or are in course of construction there.

J. H. Worden, the local "captain" of the game, has a couple of monoplanes; W. C. McDaniel has a Bleriot type monoplane; Lester Miller, of the Texas Aviation School, uses a tractor biplane; W. E. Virgil, of the Dodge Brothers Motor Company, uses a Curtiss exhibition biplane; Heiny Schmidt, of the General Welding Co., also uses a Curtiss biplane; Frank McCarroll has a monoplane, and Sam Richardson has almost completed a Curtiss type biplane. Altogether the season in the Dallas region promises to be a lively one.

Government Buys Bomb-Dropping Device

The Government, after tests by naval officers, has purchased the invention of a Philadelphia youth which will drop bombs accurately from an aeroplane, according to a press dispatch from Philadelphia.

The inventor is Alfred J. Erickson. He is 19. His father was working on the bomb-dropping device when he died. The boy took up the problem, finally got a patent and brought the invention to the attention of the Government. Tests made at Norfolk with a hydro-aeroplane have shown that bombs can be dropped within a radius of twelve feet. The device adopts the idea of an automatic range finder for guns. In a frame before the face of the aviator is an indicator by which he can plot out any object in sight on the ground and time the release of the bomb.

Aviators Will Fly to New York in War Game

Aviators will fly to New York from Eastern cities during the National Guard "war games" at Sheepshead Bay. They will attempt new altitude and speed records. Prizes will be awarded. Glenn H. Curtiss has announced that he will enter at least three fast machines. Thirty aviators, now learning at Newport News, Va., are eager to fly to New York. Efforts are being made to get machines for them. The committee in charge of the aerial part of the war game is composed of Major Carl Hartman, U. S. A.; Commodore J. Stuart Blackton and Alan R. Hawley, president of the Aero Club of America.

Caleb Bragg in the East

Caleb Bragg, the well-known automobile racer, has arrived in the east after an extended stay at the Glenn L. Martin Aviation School, where he has been taking a course in flying. Bragg proved himself an apt student and is already a skilled aviator. There is very little doubt but that, with the machine which he is having especially constructed, he will be heard from in the speed and altitude record class during the summer. He expects delivery of the new machine within the next two weeks. It will be of the Martin Model S seaplane type, equipped with a special Hall-Scott motor, illustrated elsewhere in this issue. It will carry a pilot and two passengers; it has a span of 52 feet, chord of 6½ feet, length over all of 31 feet, and a total surface area of 630 square feet. Its climbing speed will be 3,000 feet in ten minutes, with a gliding angle of eleven to one. Its useful load is 650 pounds, and the entire weight of the machine 2,450 pounds.

Dijon de Waray, President of the Interstate Aircraft Co.

Curtiss Club Organized

Two hundred members of the staff of the Curtiss Companies in Buffalo have organized what will be known as The Curtiss Club.

At a recent meeting the officers were elected as follows: Honorary President, Mr. Glenn H. Curtiss; active president, Mr. A. H. Griebner; vice-president, Mr. E. H. Cawthra; second vice-president, Mr. David Wilkinson; secretary, Mr. E. N. Fales; treasurer, Mr. J. C. Callahan; Directors: Messrs. Webster, Douglas, Long and Stowe.

The purpose of the Club is to further the interests of the members in aeronautics generally by having lectures delivered on current aeronautical topics discussed.

Already Dr. A. F. Zahm has talked on the "Early History of Aeronautics" and Mr. J. P. Tarbox on the subject of "Inventions, Inventors and Patents."

The club room is in the Buffalo factory where the members meets to have lunch and the lectures are held in the Buffalo Auditorium. The proposed activities for the coming Spring include receptions, lectures, excursions and athletics.

The Sturtevant motored Burgess pusher of the type being supplied to the British authorities

The Raid on the Capitol

Washington was "attacked" from the air Saturday night of last week, and the Capitol, White House and War College were technically wiped out of existence when De Lloyd Thompson, piloting a Gyro motored Day tractor, at a height of 3,000 feet, drove his machine over the city and dropped harmless pyrotechnic bombs, timed to explode 1,000 feet above the city.

The night "attack" came without warning. The flash and white smoke of exploding "bombs" brought a touch of realism which startled Washington residents and gave them an idea of the terror inspired in the cities of Great Britain, France and Germany, where such attacks have become a customary method of warfare. Police Headquarters and newspaper offices were flooded with inquiries.

Searchlights which played across the sky endeavored vainly to reveal the machine, but helped only to make visible the white patches of smoke which followed in the wake of the falling "bombs."

Only the outline made by the bright light which the aviator carried on his machine enabled the people in the streets and the parks to follow the course of the "raider." At all times he was successful in eluding the gleams that shot back and forth from the searchlights, and at will dropped the "bombs," which exploded with the noise of booming cannon.

His operations began in the vicinity of the Washington Monument, in Potomac Park. Hundreds of automobiles were stopped in the driveways, and pedestrians congregated on the streets to watch this first "attack" on Washington by an "armed" flyer.

He demonstrated successfully how easily the Nation's capital could be taken by surprise and its official centres destroyed.

Thompson began his flight from the polo field in Potomac Park, equipped with fireworks of bomb character and flares, which were set off by electricity. Reaching a high altitude, he flew for the Washington Barracks and the War College Grounds. Officials of the barracks were among the few persons who had previous knowledge that the city was to be "bombarded" by an airman, and, as the faint light, high in the sky, moved toward them they set their powerful searchlights to work in beginning their defense of the city.

When directly over the War College the first of the "bombs" was dropped, and it was this report that set the populace astir, the noise sounding like the booming of cannon on the practice grounds at Fort Myer. The searchlights only "caught" the smoke, which floated in clouds high above the earth.

Thompson turned and flew over the Capitol, where he set off other "bombs." From there his course took him over the White House, which he "destroyed," with the adjacent Government buildings.

His experiment ended with looping the loop and circling around the Washington Monument. His landing in the Polo Grounds was made easy by rows of red lights.

In commenting upon his raid, Thompson had this to say:

"My purpose in making tonight's raid over the residential, business and national building sections of Washington was to employ the most effective method of impressing officials and members of Congress and Senate how absolutely at the mercy of hostile aircraft are the great cities of our country.

"I could have blown the White House and Capitol off the map had I been armed with the most deadly explosives, instead of fireworks bombs timed to explode 1,000 feet in the air.

"My next raid will be far more spectacular than tonight's, and will be unannounced.

"I will visit New York under the cover of darkness before I finish my campaign of acceleration of sentiment for preparedness. From the viewpoint of the spectacular my raid will be the nearest to a genuine Zeppelin demonstration that will be witnessed in time of peace.

"My trip is being financed by a group of wealthy men who are sincere in their efforts to arouse the citizens of the entire country to the need for aerial preparedness. In our whole country we have not one anti-aircraft gun with which to combat the aerial enemy."

Ball Bearings As a Sales Factor

The publicity material of the S-K-F Ball Bearing Company has always been characterized by a decided ability to "get there." The latest effort, "Ball Bearings as an Automobile Sales Factor" is worthy of its predecessors and represents a presentation of a subject which is of real importance to all parties interested in engines of any kind, for it is at once interesting and instructive. We await with more than ordinary interest the publication by the same Company of a similar brochure on "Ball Bearings as an Aeroplane Sales Factor."

The Committee of the Aero Club of America on their recent visit to Newport News, Va. Left to right: W. Norton, Philadelphia; L. D. Gardner; Clarke Thompson, Philadelphia; Professor David Todd, of Amherst; Glenn H. Curtiss; Henry Woodhouse; G. Douglas Wardrop; Robert E. Peary; and Robert E. Peary, Jr.

GOVERNMENT MANUFACTURE OF AEROPLANES—A NATIONAL MENACE!

By EUSTACE L. ADAMS, in Popular Science Monthly

A GOVERNMENT factory for the manufacture of aeroplanes and motors. The specter which haunts those who hope to see the United States take her place among the nations with a fleet of aircraft which will demand, and receive, respect! The experiment which cost Great Britain nearly five millions of dollars, and produced, altogether, fourteen flying officers and seventeen aeroplanes at the end of a wasted three years!

There is a strong Southern movement, of which Senator Duncan U. Fletcher is a leading spirit, to establish at the new aeronautic base at Pensacola, Florida, a government factory for the manufacture of aeroplanes and motors for the Navy.

Senator Fletcher, in defending his attitude, says:

"I am strongly of the opinion that the aeronautic base (at Pensacola) should be equipped to manufacture aeroplanes and motors. Not to manufacture all that we may require, but a considerable number. This will act as a stimulus to private manufacturers, as a nucleus for a considerably increased output in war times, as a check on any tendency toward slackness on one hand, or too high prices on the other, by private manufacturers. Experiments may be conducted there which will evolve a highly valuable type of military aeroplane. There a highly trained force may be created, and a training and industrial plant built up, capable of infinite expansion on the government's 1,400 acres, which would be of service that cannot be estimated to the country in time of war. The government has an opportunity to build up a modern manufacturing plant, school and experiment station at Pensacola that will attract the best of the official and enlisted personnel of the Navy as well as the most skilled workmen."

A year ago the Secretary of the Navy requested the Bureau of Construction and Repair and the Bureau of Steam Engineering to investigate and make a report upon the advisability of having the Navy enter upon the manufacture of aeroplanes. This report, which the Secretary transmitted to Congress, advised strongly against such an attempt. Some of the reasons given were:

"It would be a tremendous loss to the advancement of aeronautical work to lose the ideas and results of private investigation and experiment. The establishing of a government plant for the general manufacture of aircraft would require a complement of officers that could be ill-spared at the present time, not only because the Navy has a very limited number of specially trained designers in this class of work, but because such a plant would call for the diversion from actual flying work of many of the most competent operators. Any government plant which could be established in the near future would be entirely inadequate in war time, as aircraft would be required in large quantities for such an emergency."

In spite of this report, the project is still being agitated, and numerous officials appear to be in favor of establishing such a factory. Southern newspapers, particularly those conducted in Florida, are jubilant, but it is to be hoped that they are "counting their chickens before they are hatched."

Senator Fletcher says that government manufacture would act as a stimulus to private manufacturers. When did government competition ever act as a stimulus to private manufacture? Certainly not in Great Britain when the government was conducting its costly experiments along those lines. Great Britain found that by means of government manufacture it could not keep up with the foreign powers in times of peace. How did it hope to produce the thousands of aeroplanes necessary in time of war, especially if the private manufacturers had been driven out of business by government competition? At present, after a year and a half of warfare, and although private manufacture of aeroplanes took a tremendous boom after the failure of the government's experiment, Great Britain is forced to buy almost the entire output of the many American aeroplane factories.

Should war be declared upon this country after the private manufacturers had ceased their efforts, because of government competition, the government factory would not be able to supply the needs of our Army and Navy. It is conceivable that we might not be able to cross the ocean in search of privately manufactured aeroplanes. In that case we would have to build up the industry from the start, while thousands of enemy aeroplanes hummed over our heads, and dropped bombs upon our ships and troops.

Mr. Henry Woodhouse, a Governor of the Aero Club of America, in expressing his opinion of this project to the writer, said:

"Manufacturing of aeroplanes and motors, which Senator Fletcher proposes, is inadvisable, first, because it would retard the development of naval aeronautics, and second, because it would discourage the youthful aeronautic industry. Needless to add, there is, therefore, no argument in favor of the proposition."

There are many persons, interested in the problems of national defense who see in such a project a real start toward a greater air fleet, and overlook the fact that it is a start in the wrong direction. It is probable that they cannot see the far-reaching evil results of such a step. On the other hand, a large number of far-seeing advocates for real preparedness are displaying great concern that so obvious a "pork barrel" proposition should receive even the most casual attention of Senators and Congressmen at a time when the nation seems at least awakening to the shocking condition of army and naval affairs, particularly in the branch of aeronautics.

Mr. Alan Hawley, president of the Aero Club, the public-spirited organization that is leading the vast movement to supply the National Guard and Naval Militia of the various states with aeroplanes, said to the writer:

"So long as the appropriations for aeronautics for the Army and Navy are not sufficient to meet the actual need for aeroplanes and for the training of aviators, there is no justification for spending the small amount available for factories and experiments. The dozen or so aeroplane manufacturers and aero motor makers have shown that they are able to supply, in any quantity needed, the type of aeroplanes and motors required, and they have assured us that they will be at all times ready to do their utmost in every way to supply the aeronautical needs of the Army and Navy."

Mr. Augustus Post, one of the fathers of the Aero Club, an experienced balloonist and a pioneer aviator, gives us his views on the matter. He says in part:

"It would seem just at this time that it would be well to purchase what has already been perfected by the manufacturers in this country and so well proven abroad, and that the Army and Navy might well devote their energies, at present at least, to training men to fly and in perfecting an aerial organization which could be moved where needed. The developments are bound to be so rapid in the near future that immediate steps must be taken to keep up with even the present rate of progress, and it would seem that rather than extensive laboratories, schools of flying should be established and the manufacture and inventive side of aeronautics left in the hands of those who are doing so well and who have accomplished so much."

As was pointed out in the last issue of the *Popular Science Monthly,* the aviation corps of our Army and Navy are at the present time rather ghastly jokes. Congress has continually overlooked aeronautical needs, and the little money appropriated has been sadly misspent. A recent court martial of one of the officers of our Army Aero Corps afforded the public a glimpse into the rottenness of affairs when politics are applied to our infant aeronautical efforts. If government manufacture is introduced at Pensacola, perhaps it will be the death blow to the hopes of those of us who wish to see the United States, the birthplace of self-sustained flight, provide for its Army and Navy a fleet of aircraft which in time of war would safeguard our Navy, our fortifications, and eventually our homes.

AUTOMOBILE MANUFACTURERS MAKING MOTORS IN ENGLAND

A STUDY of the automobile industry of Great Britain made by a representative of the trade paper, *Automobile*, of this country, prompts the investigator to make the statement that "the bulk of the aeroplane motor construction is in the hands of eight automobile firms, of which five are building V motors and the three others various types, including "V's."

Although, the writer continues, every type of motor is in use, including Gnomes, eight-cylinder air-cooled, eight-cylinder water-cooled, six-cylinder vertical water-cooled, and twelve-cylinder water-cooled, the tendency is towards the V water-cooled motor with eight or twelve cylinders. Power is increasing, the opinion holding that comparatively few motors will be produced of less than 200 h.p.

For hydroaeroplane work numbers of twelve-cylinder motors developing 300 h.p. and more are being produced. The most important of these is a twelve-cylinder of 100 by 160 mm. bore and stroke. This change from 75 to 80 h.p. motors running at 1,200 r.p.m. to motors of 100, 150, 200, and even more than 300 h.p., running at 2,000 r.p.m., and having a geared-down propeller, is one of the most important developments in connection with the automobile industry.

This movement is not confined to the British, but is general throughout the Allied countries. In France, Peugeot and other factories working in conjunction with them are producing thousands of eight-cylinder V motors, the direct outcome of racing practice. In England the twelve-cylinder Sunbeams for aviation work have only been made possible by reason of racing experience.

While there is very little use of aluminum alloy pistons to be found on the Continent, the leading English firm uses aluminum-alloy exclusively. It is understood that this firm has spent $10,000 on experiments and has produced an aluminum nickel alloy piston which is perfect and can be used with the same clearances as an all-steel piston.

The aviation motor which is attracting the greatest amount of attention is the eight-cylinder Hispano-Suiza now being built in England. This motor is probably the first aluminum cylinder engine to be built in any quantities. It was first produced more than a year ago at the Barcelona factory of the Hispano-Suiza company and brought before the French authorities, who have decided to adopt it and had it built in the main factory of this company at Paris. It has since been taken up under license by other firms in France and more recently has been secured by the British government.

This motor has its cylinders cast in groups of four with steel liners inserted. A detachable cast-iron head carries the valves—two per cylinder—and the overhead camshaft is driven by bevel gearing and a vertical shaft at the front end of the motor. One of the patented features of this motor is the direct operation of the cams on the valve stems, without any intermediate mechanism. The general principle is shown in the illustration. There is a separate carburetor for each group of cylinders and lubrication is under high pressure to all parts, with the oil passing through a radiator.

The valve stem is hollow and has an adjustable tappet screwed into its open end. The upper end of the tappet rod carries a disc, which is slotted on its edge and formed with teeth on its under side. Beneath this disc there is a second disc, which is threaded on to the tappet rod, so that the rod can turn in it, but this second disc is keyed on to the valve spindle by two lugs formed on the end of the spindle. The second disc also has teeth formed on its upper face to engage the teeth on the first disc, and the two are held in engagement by a spring.

Adjustment is effected by screwing the tappet rod up or down in the valve spindle, and it is locked once it has been adjusted by the inter-engaging teeth on the two discs, for the lower disc cannot rotate relatively to the valve spindle. The adjustment is effected by a double toothed wrench, one tooth being engaged with circumferential holes in the lower disc and the other tooth being engaged with the slots in the edge of the upper disc so that turning one of the wrenches causes a slight relative movement of the discs.

This motor drives the propeller through spur reducing gears. With a bore and stroke of 4¾ by 5⅛ in. the motor weighs 363 lbs. when equipped with two magnetos and a duplex carburetor. Cooling water is not included in this weight. Fuel consumption is 11 gal. of gasoline and 1 gal. of oil per hour. Horsepower is 200.

Official aeroplane motor tests are now very severe. The French authorities demand 50 hours' constant running, half of this at three-quarters power and half at full power. The British put all motors through a 100 hours' test before accepting and in the case of big units make them run at the end of 100 hours with the propeller out of balance for a short time.

SAYS DIRIGIBLES ARE NEEDED ALSO

MR. H. E. HONEYWELL, Director of the French-American Balloon Co. of St. Louis, Mo., makes plea for recognition of the utility of the dirigible in preparing for national defense. It, he says, the nation is going to prepare, let it be done on a broad and up-to-date basis. There are many different types of fighting war craft, each with its particular offices; why should not the same principle apply to the air?

"We have contended from the first," he writes, "that aeronautics in both branches, lighter-than-air and heavier-than-air craft, are not only practical but absolutely essential, particularly in time of trouble, and we have but to look over the seas for proof. It has dawned upon a few of our statesmen that aeroplanes are useful for scouting purposes, but they do not dare appropriate the price of a single battleship for that purpose. Colossal extravagance! And yet there has not been a single decisive blow struck by the navy of any of the warring powers to date.

"Their battle cruisers are all air craft, and they are using and building all they can get."

Mr. Honeywell directs attention to the fact that while the aeroplane is master of the air during the day, their scope of operations at night has thus far been limited, and he warns against neglecting to make provisions for the construction of dirigibles, which, by their raids over France and England, he says have proved to be the kings of the air at night. Mr. Honeywell says that, like the aeroplanes, the dirigibles are new weapons of war which must be reckoned with in the near future. He advocates the construction of a few on absolutely new lines, while there is yet time to build and develop them.

The dirigibles, Mr. Honeywell says, have their particular field of usefulness still to be developed, and he advocates that in putting the nation into a state of adequate preparedness the importance of the dirigible should not be ignored.

Mr. Honeywell further points out that small captive balloons, equipped with light steel cars carrying an observer in each of the Mexican border cities could discern the enemy hours before he could arrive from any direction, phone the information to headquarters and by means of motor cars the invaders could be intercepted, or soldiers could be massed at the point of attack.

"A few such machines," he says, "could patrol the entire border much more effectively than thousands of troops subjected to snipers, not to mention the decided advantage in cost."

The French-American Balloon Company has perfected a fabric that will retain hydrogen gas almost indefinitely, and will not be affected by either the heat or the blue and violet rays of the sun, as is rubber. Last year the company gave it a very severe test. They inflated an eight-passenger captive balloon at Electric Park, Kansas City, on May 23, and held it during the entire stormy period until the close of the Park on September 6. During that period over 5,000 passengers were carried without a mishap. The same balloon will be operated in the same place this year, and a similar outfit will be installed at Forest Park, St. Louis.

The company is also working hard on a dirigible. Plans have been perfected for an airship on the order of the Zeppelin, which is capable of carrying twenty passengers from St. Louis to New York City in twenty-four hours, without a stop, if necessary. The company has also perfected a device whereby a load of bombs can be carried without interfering with the equilibrium as they are dropped off.

SOME FEATURES OF THE GREEN 300-H. P. MOTOR

CONSIDERABLE space has lately been devoted in technical publications abroad to the big Green 300-hp. motor in which have been developed and perfected features of such ingenuity as to challenge the admiration of aeronautic engineers. Geoffrey de Holden-Stone is unusually enthusiastic over it, in a series of notes appearing in the *Aeroplane* of London.

The big twelve-cylinder is very much of a Y-type rather than a V type, "because for one thing you get a notably better thrust on the crankshaft, and in an eight or twelve cylinder merely a negligible increased tendency. For another because, with overhead valve gearing, you can push this Y formation to quite an extreme; and for still another because it gives a handier installation in an aeroplane with more room on either side." The Y-type motor will fit any machine of a type demanding such power and may even replace a big vertical without any particular increase of fuselage beam forward.

"The crankshaft has been generously thickened and therefore widely hollowed and strengthened. You would have thought perhaps that the connecting rods might, *en suite*, have been likewise hollowed as oil conduits to the gudgeon-pins and cylinder walls in the classic De Dion-Maudsley fashion. No doubt, if this were a car or a marine motor. But it isn't. It is a motor for which every pint of oil that is saved means anything from one to five miles further flown. One, furthermore, in which the weight of reciprocating parts is a most important factor. You have to choose between leaving a lot of metal in a round sectional hollow rod, with a narrow conduit feeding only the right amount of oil, or an almost tubular one, light enough in itself but containing a lot of oil of no negligible weight, and feeding altogether too much of it.. For again we have to consider a motor proposition which must give clean combustion, never fouling the plug. There can therefore be no better compromise with the conditions than the chosen H sectional rod, with its shank drilled out in a dozen holes, and the bucket extensions on the big ends, which throw all the oil on the big cylinder walls, that they, the pistons, or the gudgeon-pins need as it comes from the crank shaft.

"The pistons are short-kilted, but around the piston heads between the rings there are turned two little oil grooves which get as much oil as is needed to the right spot and pocketing it, keep it from rising above the last ring. The piston is mostly waist, excepting in the sleeving of the gudgeon-pins, the waist alone forming a large oil pocket.

"And in all Green models you will notice this unique point—I have never seen it in any other—that the gudgeon pin is secured solid to the small end of the connecting rod, so as to oscillate in its own brasses, instead of being pinned stationary in one or the other of the conventional ways. The advantage of this is three-fold. First of all the two fastening screws set through the grip of the small end in this way—and, in any case handily wire-coupled through their heads—get no jar from the piston and thus can not work loose—even if not so wired for extra security. Secondly, as they can not loosen, the gudgeon-pin can not slide endwise to score the cylinder wall. Its ends come short of the full piston diameter from one-sixteenth to an eighth of an inch, so additional oil pockets are formed. With these and the oil they collect we get the third advantage that the oil gets worked nicely into the bearings by the slight oscillation of the gudgeon before the heat of the piston head can get to it. So, never being burnt, this part never goes dry; and no ovalisation can take place to produce any undiscoverable knocking."

"There are a few more points about the Green valve—cavities * * * They secure the advantage of a practical head of water just where it is most needed, with the further effect of cooling not only the valves to a greater degree than in any other design, but also the exhaust passages, as well as warming the induction just before the mixture entry, the great secret of complete and economical running."

To guard against the possibility of a pin-hole or an invisible crack in the containing belt flanges, the Green has a water-seal device. "This consists of a pair of flange rings, each one halved with the ends of each half stepped, or rather scarfed over one another. These rings are of a size to fit closely but freely around the cylinder and are bolted together all around with screw bolts threaded into the upper one, the bolts of course being set through holes in the ring of rubber between the metal ones. Now these all being set on and the copper jacket over them, it is obvious that the more the screw bolts are tightened, the more the rubber is compressed between the upper and the lower rings, and expanded inwardly against the cylinder trunk and outwardly against the jacket, with an altogether better result than the old way."

Especially interesting is the distribution system of lubrication. An internal pump is none too accessible if anything should go wrong with its mechanism. The more direct and appropriate way is to have the pump external, when the immediate problem is to do without piping. "The obvious way is to bore or otherwise run your main distribution conduit through the metal of the crank chamber lengthwise, and to drill branches across and diagonally through any webs there may be, and so to the housing of the journal brasses. In the Green system the first part of this is done as indicated, but the branch supply is arranged much more easily and not less effectively. The vertical holes of the cylinder and journal supporting bolts are there anyway, duly drilled through the crank chamber casting. But by making the threaded bolt ends a full sixteenth thicker than the intermediate shanks, it follows that a tubular chamber is formed around each shank. Nothing then is easier than to drill short leads into this chamber from the main conduit above, and direct to the bearings below. Which done, as in this case, the bearings are at least lubricated first of all, the surplus oil then finding its way under pressure into that huge centrifugal conduit which is the crank shaft, and which subsequently anoints the cylinder walls as they need it from its own store.

"How does the Green motor manage to give its full power, —no matter whether it be standing on its tail or diving on its nose or even during a looping stunt? Even its not over-powerful force-feed does not wholly tell the story, though interesting as far as it goes, since it is very simply effected by fitting little wind-cowls to the crank chamber breathing tubes and then connecting these upwardly again with similar cooled air tubes leading downward into the mixing chamber of each carbureter directly over the jet. But that at least explains how, while the *balance* of pressures keeps the carburation regular, the *combination* of both forces the mixture in a steady rush upwards through the trunk and manifold into the inlet passages.

Sloane-Day Tractor Reaches High Altitude

On Monday, April 10, De Lloyd Thompson, together with his mechanic, Nick Schreyer, piloted the Sloane-Day Military tractor biplane, with 125 horsepower Hall-Scott motor, to a height of 13,950 feet.

The wind was blowing about sixty miles an hour, and Thompson was forced to land near Hicksville, twenty miles from Garden City, owing to his fuel being exhausted. The last few thousand feet of descent was made by volplaning, and the machine landed in a plowed field. Atmospheric conditions were unfavorable, and the flight took two and a half hours instead of an hour and a quarter, as was expected.

The record is official, as it was properly observed and reported to the Aero Club by a representative appointed by Lieutenant R. C. Bolling, of the New York National Guard Aviation Corps.

Thompson has been an aviator for a number of years, and is the holder of Expert License 8, which was awarded to him in Chicago in 1912. In addition to having done such spectacular flying, he had a narrow escape in Chicago on August 2, 1913, when the rudder of his machine broke and he volplaned 2,000 feet.

Dr. Bell Advocates Aerial Preparedness

In an address before the Navy League of the United States, on April 13, Dr. Alexander Graham Bell pointed out the vital importance of an adequate number of aeroplanes and hydroplanes as a measure of preparedness.

"If the United States were plunged suddenly into war, enemy aeroplanes could hover over the Capitol and destroy it, no matter how strong the Navy might be in ships," he declared.

"This is the great problem and opportunity of the Government today. The time is already here when both land and sea power are secondary to air power. The United States is the birth place of aviation. It has a good chance to control the air, provided no time is lost in going about the task and ample funds are provided."

He advocated aeroplanes rather than dirigibles on account of their great speed and other qualities.

COMMITTEE ON INDUSTRIAL PREPAREDNESS AND AERONAUTICAL STANDARDIZATION ACTIVE

MR. HOWARD E. COFFIN, Chairman of the Committee on Industrial Preparedness of the Naval Consulting Board, and Chairman of the Standardization Committee of the American Society of Aeronautic Engineers, is doing very valuable work in connection with both organizations. We have been particularly impressed by Mr. Coffin's plans to carry out the work of standardization in the aeronautical industry, in which work he has had the able co-operation of Mr. Elmer A. Sperry, of the Sperry Gyroscope Company.

In the near future we hope to print the official report of the good work being done under the direction of these two gentlemen by the American Society of Aeronautic Engineers.

The work of the Committee on Industrial Preparedness has naturally resolved itself into three stages. The first is to determine exactly what the country can accomplish in making munitions; the second is so to apply that knowledge that the whole of the manufacturing plants can be put at the service of the Government; and the third is so to organize skilled labor that such of it as is required will be retained in the various industries and not rushed away to the front, as happened so disastrously in the allied countries during the early months of the war. "From the way things have been shaping themselves during this war," said Mr. Coffin, "it looks as though the skilled mechanic of the future will win the wars of his country, and that the banker, if you like, and the lawyer will be merely the men who will carry the gun to the front, there to serve the useful purpose of cannon fodder."

In laying out its plan of campaign the Committee on Industrial Preparedness realized that the work of tabulation and administration would have to be in the hands of the engineers of the country. In answer to a letter of President Wilson to the presidents of the leading technical organizations of this country, namely, the mining, civil, mechanical, electrical and chemical engineers' societies, a member of each society in every state in the Union was formed into a board of directors, which provided a board of directors of five men in each state. Serving under them are thirty thousand of the skilled engineers of this country. The first work to be done by these engineers will be to collect complete data as to the industries of the country. This will be done by means of printed forms, in accordance with the procedure and practice of the United States Census Office. The census will affect from thirty to thirty-five thousand concerns, and it will secure from them a business inventory of the character which any business man would require regarding any concern with which he is going to enter into business relations. Each form will have filled in the name of some concern regarding which information is sought, and it will be passed on by the state directors to the field engineer who is assigned to gather data regarding that particular plant.

Very considerable impetus will be given to this movement by the hearty co-operation of the National Chamber of Commerce, which has addressed a referendum to the chambers of commerce throughout the United States, which includes resolutions that coincide very closely with the program of the Committee on Industrial Preparedness. When the inventory, which will be made probably during the month of May, is complete, the next task will be to get the industries which have been enumerated into such shape that they can efficiently do the work required. Mr. Coffin states that there is not a manufacturer in this country who can start on quantity production of shells within one year after the receipt of an order, unless he has previously done shell work in his plant—in other words, the manufacturers have to be educated in the production of munitions, and this in times of peace. War-time demands are such that it will be impossible to provide sufficient government-owned plants to meet them. A certain number of Government plants we must have, and they should be scattered through the country. They should act as educational centers and clearing houses for specifications and blue prints; but in any future war of magnitude it us upon privately owned plants that we should have to depend. It would be a positive calamity if legislation in Congress this year should merely create a larger Army and Navy and a few munition plants, and then settle down under the conviction that the country is prepared.

As showing the extremely special character of the work which is called for in producing implements of war, Mr.

(*Continued on page* 195)

How standardization has worked out in the automobile industry. A continuous horizontal band would indicate that a given manufacturer made use of all the standards on the list

THE HAMMOND RADIO-DYNAMIC TORPEDO

IN the appropriation bill for coast defenses and fortifications introduced by Representative Sherley, of Kentucky, Chairman of the House Committee on Fortifications, is one item covering the purchase of an invention so astounding in its possibilities that its installation should make all the other defenses practically unnecessary. This invention, which the bill proposes to make the exclusive and secret property of the United States, is the radio-dynamic torpedo, or Hammond destroyer, conceived and perfected by John Hays Hammond, Jr.

This young man is only six years out of college, yet at the age of twenty-eight he has devised a torpedo which can be guided by wireless from shore, from a battleship, or from an aeroplane, and which will carry a ton of devastating explosive at the rate of twenty-seven miles an hour under water, straight to the heart of a battleship miles out at sea.

Built either as a torpedo boat or as a torpedo—one for surface work and the other for use under water—it can be steered by wireless in any direction, under absolute control of one man seated with a telescope in one hand and an electric key under the other. This man may be in a station on shore, he may be in a battleship well out at sea, or he may be hovering out of range of any enemy's fleet in an aeroplane.

The engine which drives both the torpedo boat and the torpedo can be run at any speed and stopped or started at will. They are driven by gasoline.

The surface type of weapon can be driven through the water at a speed of fifty miles an hour. The undersea type will travel twenty-seven to twenty-eight miles an hour.

Its gyroscopically manipulated rudder is so senstively under the control of the operator that Mr. Hammond, in tests conducted at Gloucester, Mass., with a bamboo pole an inch and a half in diameter stuck up in the water as a target three and a half miles from shore, actually hit that tiny object with his torpedo ten times out of fifteen! With this uncanny accuracy, to miss an object as large as a battleship would be next to impossible.

The transmission of power is of a selective type discovered by the inventor, which makes it impossible for an enemy to interfere with it by other wireless waves. If by chance the enemy should discover the wave length which was being used, a different wave length could be substituted while the torpedo was still speeding toward its goal. Not this alone, but if an enemy makes the attempt to interfere with it by wireless, the torpedo, by the exercise of qualities well-nigh supernatural, turns at once and makes for the source of the interfering waves!

It can be operated by day or by night. In the latter case, cleverly shrouded lights indicate the weapon's whereabouts to the man in control of it, without revealing its approach to the enemy.

It carries a searchlight which the man at the wireless key can turn on or off at will.

It may be guided 200 miles out to sea by a following aeroplane and then launched against its target without diminution of speed at the end of its long trip.

It can carry a ton of the most powerful explosives yet devised by science. The usual load of a torpedo is 300 pounds.

It has been operated and controlled by one man at a distance of twenty-eight miles, or much further than an approaching ship could be seen from shore.

In case the battleship aimed at should move beyond the radius of control, the torpedo can be "passed along" to another operater in a neighboring station, who then begins directing its movements in the new radius which the enemy's craft has entered.

The torpedo boat can carry a torpedo out to sea and launch it against the enemy at close quarters. If the missile hits its mark the boat can be turned around and brought back to its source. If the torpedo misses, the boat which brought it there and which carries an additional half ton of explosives, can be driven forward as a secondary projectile in a corrected line of flight. It would be destroyed when it struck, but it would also destroy whatever lay in its path.

The fact that in this manner a charge of explosive can be delivered at its target under constant control from its source—a thing never before accomplished—makes the accuracy of the Hammond destroyer greater than the big guns now used in coast defenses.

Mr. Hammond has guided his torpedo from an aeroplane at a distance of a mile with the ordinary aeroplane wireless apparatus now in use. He believes this radius can be extended to five or six miles unquestionably. An additional feature of controlling the torpedo from aloft lies in the fact that an aviator can see objects on the water during foggy weather when they are indiscernible to horizontal vision.

The power for defense contained in a series of these control stations located up and down our coasts is incalculable. The experiments which have made it possible have cost him about $300,000. Fortunately, he had the means to carry on his experiments without lacking for anything which might contribute to his success. Under the terms of a letter to the War Department, dated February 6, 1915, Mr. Hammond proposes to dispose of the exclusive rights to his invention as follows:

> He will assign all patents to the United States Government for the sum of $530,000, plus 10 per cent. of the cost of installing each radio station, whether ashore or afloat, plus $10,000 royalty for each destroyer built. This is based on an order of not less than three units, a unit consisting of one station and ten destroyers. If the Government builds only two units, the lump sum is to be $630,000. If it builds only one unit, the lump sum is to be $730,000. In addition, Mr. Hammond will give his time and his services to the Government in installing and developing the system so long as the War Department wants him.
>
> As an alternative proposition, in case the Government does not want the exclusive rights, Mr. Hammond will sell the manufacturing rights for the United States alone for $350,000.

Christofferson Motor Tested

The new aeroplane motor, designed by Silas Christofferson, was put through a brake test at the Automobile Club of America's testing laboratory last week.

The motor developed 117 horsepower at an average of 1,475 revolutions a minute, from 2 o'clock until about 6, when an accident to the rocker arm necessitated stopping for repairs. At about 8:30 o'clock magneto trouble ensued, and the test had to be abandoned. It probably will be resumed after repairs have been made.

Private tests which have been conducted show some remarkable results. The standard non-stop test of the United States government is four hours. The British government requires a non-stop test of eight hours. The Christofferson motor, according to its inventors, has shown a non-stop record of sixty hours in private demonstrations.

One of the most substantial features in connection with the Christofferson invention is the light weight of the motor. It weighs but 460 pounds and measures sixty inches over all. The motor is fourteen inches in width. The horsepower, at 1,400 revolutions per minute, is 130. The motors will be supplied with especially constructed carburetors furnished by the Harry A. Miller Manufacturing Company of Los Angeles.

None of the moving parts of the motor will be exposed to dust, dirt and other refuse matter, these parts being protected by neat-looking aluminum caps. This will prevent clogging of the mechanism and will enhance the non-stop value of the motor.

The new motor contains six cylinders, is constructed of steel and aluminum and is especially adapted for non-stop service. With a pilot and one passenger a speed of ninety miles an hour may be maintained. The motor will be equipped with two magneto attachments. If one is disabled the other will take up its burden, with but slight reduction in the motor's capacity.

Mr. Christofferson, who was the first aviator to fly from San Francisco to San Diego, is confident that he can make this trip in a sustained flight by using a new motor and a military aeroplane.

Mr. Christofferson attained a height of 16,000 feet when he crossed the mountain ranges en route from San Francisco to San Diego; now, he thinks it will be possible to fly at a height of 20,000 feet when the new motor is installed in the military type of aeroplane. He anticipates no difficulty in negotiating the mountain passes when he next attempts this flight, and believes he can make the journey from the bay city to San Diego in eight and one-half hours.

NOTES ON THE DIMENSIONAL THEORY OF WIND TUNNEL EXPERIMENTS

By EDGAR BUCKINGHAM
United States Bureau of Standards

(Continued from last week)

Remarks on the Resistance of Flat Plates Normal to the Wind

From equation (8) it would appear that when R is proportional to S^2 it must also be proportional to D^2, and yet this does not seem to be true for flat plates normal to the wind. On the contrary, while $\frac{R}{\rho D^2 S^2}$ is nearly independent of S, the results of various observers indicate that it increases somewhat as the diameter of the plate increases from a few inches to a few feet. Leaving aside the improbable supposition that this effect is only apparent and due to observational errors, the most obvious explanation is that compressibility may not be entirely negligible. If that is the explanation, equation (9) and not equation (8) is the one to be used, and it is quite conceivable that $\phi\left(\frac{DS}{\nu}, \frac{S}{C}\right)$ might have such a form as to be independent of S without being entirely independent of D. Computations of the amount of compression to be expected at the speeds in question[1] seem to show that the discrepancies are too large to be accounted for in this way. But it may be remarked that in some of the details of the turbulence much higher speeds may occur than the speed of the wind as a whole. Hence compression might occur locally, in some parts of the field about the body, to such an extent as to modify the flow and so affect the resistance, even though computations based on the average speed of the wind might indicate that the effects of compression could not possibly be appreciable under the given experimental conditions.

Mr. Hunsaker's observations on circular disks suggest, however, that there may be another interpretation of the effect in question which does not oblige us to have recourse to the unlikely supposition that compressibility is of importance. If, as appears from these experiments, there is a critical range of speed determined by the form of the edge and not dependent on the size of plate, it seems possible that some of the apparent discrepancies between $\frac{R}{S^2}$ =constant and $\frac{R}{D^2}$ = variable may be due to the experimental results of various observers having been influenced by such critical phenomena, which were not, however, sufficiently marked to attract attention.

To decide whether an explanation of this sort is applicable would require an experimental study of the forms of edge which have been used; for until the critical speeds for these edges—if they have any—have been investigated, it is impossible to say whether the speeds at which various experimenters have worked may have overlapped with these critical ranges. Nothing more definite can be said, at present, than that it is well to pay close attention to geometrical similarity; but it seems that a further experimental study of the resistance of flat plates, undertaken with the foregoing possibilities in mind, might lead to interesting results.

Dynamical Similarity

Let us suppose that we are confronted with a problem of design which requires our knowing, in advance, the head resistance, at a prescribed speed, of some body such as an air-ship which is too large for direct experiment. The question is, how to get the desired information from experiments on a small model which can be made at a permissible cost.

Returning to equation (9) or

$$R=\rho D^2 S^2 \phi\left(\frac{DS}{\nu}, \frac{S}{C}\right) \tag{11}$$

we notice that whatever be the form of ϕ, if its two arguments have the same values during two different experiments on geometrically similar bodies, the value of ϕ itself will be the same in both experiments. This observation leads to the notion of corresponding speeds and dynamical similarity.

Let us suppose that we require the resistance R of a body of size D at the speed S in a medium with the properties ρ, ν, C; and that we have a model of the size D_m, which can be run in a medium with the properties ρ_m, ν_m, C_m. Then if we run the model at a speed S_m, such that

$$\frac{D_m S_m}{\nu_m}=\frac{DS}{\nu} \text{ and } \frac{S_m}{C_m}=\frac{S}{C} \tag{12}$$

and observe the resistance R_m, we know by equation (11) that

$$\frac{R}{R_m}=\frac{\rho D^2 S^2}{\rho_m D^2_m S^2_m}. \tag{13}$$

For when equations (12) are satisfied, $\phi\left(\frac{D_m S_m}{\nu_m}, \frac{S_m}{C_m}\right)=\phi\left(\frac{DS}{\nu}, \frac{S}{C}\right)$, so that ϕ cancels out when we divide equation (11) for the full-sized original by the corresponding equation for the geometrically similar model. Speeds which satisfy equations (12) are "corresponding speeds," and when two geometrically similar bodies are run at corresponding speeds they are "dynamically similar."

If the speeds are low enough that compressibility may be disregarded, the value of $\frac{S}{C}$ is unimportant and the condition for corresponding speeds, which ensures dynamical similarity, is merely the first of equations (12). If we use only a single medium so that $\rho_m=\rho$ and $\nu_m=\nu$, the condition for corresponding speeds reduces to

$$\frac{S_m}{S}=\frac{D}{D_m}$$

and geometrically similar bodies will be dynamically similar if their speeds are inversely as their linear dimensions. Any great reduction in scale might therefore involve our running the model so fast as to make the effects of compressibility no longer negligible. But if the original is to be run in air while the model can be run in water, this difficulty may be avoided. For under ordinary conditions the kinematic viscosity of water is from 1/10 to 1/20 that of air, and for a model of given size the speed required for dynamical similarity with the original is reduced in the same ratio as the kinematic viscosity.

In practice the foregoing method of experimentation is usually unnecessary. For under ordinary working conditions the resistances of aeroplanes and their separate structural elements are so nearly proportional to the square of the speed, and the effects of compressibility are so small, that for practical purposes ϕ in equation (11) or in equation (9) may be treated as a constant and equation (10) used for computation, within any ordinary ranges of D and S. *Any* speeds may then be regarded as corresponding speeds, and geometrical similarity suffices by itself for dynamical similarity. If the constant K of equation (10) has been determined by experiments on any body of the given shape at any convenient speed, the same value may be used in equation (10) for computing the value of R for a different speed or a different size or both.

Complete Dynamical Similarity

The experience with flat plates, showing that even though R is proportional to S^2 it may not be to D^2, warns us to be cautious in assuming that equation (10) may be relied on for great accuracy when the size D changes over a very large range; and it seems possible that it may sometimes be desirable to make experiments guided by equation (11) which holds for any series of geometrically similar bodies, whatever the speeds may be.

The conditions for dynamical similarity given by equations (12) can evidently not be satisfied if we work with only a single medium; for if $\nu_m=\nu$ and $C_m=C$, we have $S_m=S$ and $D_m=D$, so that no scale reduction is possible while preserving dynamical similarity. This difficulty may, in principle, be surmounted by running the model in water if the original is to run in air. Suppose, for instance, that the original is an air-ship which is to run 40 miles an hour in air, and let the model be run in water at such a temperature that its kinematic

viscosity is 1/15 that of the air. We then have $\nu=15\nu_m$ and the first of equations (12) gives us

$$15D_mS_m=DS. \qquad (14)$$

The second condition requires that the speed of the model shall be the same fraction of the speed of sound in water as 40 miles per hour is of the speed of sound in air. Since sound travels about four times as fast in water as in air, the model must move at the very high rate of 160 miles per hour, or about 235 feet per second. With this condition that $S_m=4S$, and the previous condition stated by equation (14), we have

$$D_m=\frac{1}{60}D.$$

A model to 1/60 scale run in water will then be dynamically similar to the original in air, if it is run four times as fast. Having thus satisfied equations (12) we may use equation (13); and if we set $\rho_m=800\rho$ we have

$$\frac{R}{R_m}=\frac{1}{800}\times 60^2\times\left(\frac{1}{4}\right)^2=\frac{9}{32}.$$

The resistance of the original in air will therefore be about one-quarter of the resistance of the dynamically similar 1/60 scale model in water. How soon it will seem worth while to attempt experiments of this sort cannot be predicted, but the notion of dynamical similarity shows how the problem may be attacked.

The Pitot Tube

Hitherto we have let R be the total head resistance of a solid body, but if D is the diameter of the impact opening of a Pitot tube, $\frac{R}{D^2}$ may evidently be regarded as a quantity which is proportional to the impact or velocity pressure p. Hence equation (6), as applied to the Pitot tube at rest in a current of fluid, may be written

$$p=\rho S^2\phi\left(\frac{DS}{\nu},\frac{S}{C},r',r'',\ldots\right), \qquad (15)$$

and it is interesting to compare this with the known behavior of Pitot tubes and with the Pitot equation as ordinarily given.

In the first place, we know by experience that if the impact opening is the mouth of a long tube pointed up stream, the precise form of the tube and the shape and diameter of its mouth have no appreciable influence on the impact pressure recorded. This means not only that the shape variables $r', r'', \ldots$, etc., are of no importance and may be omitted from among the arguments of ϕ, but also that D is likewise of no importance, so that the argument $\frac{DS}{\nu}$ in which it appears may be omitted. Equation (15) thus reduces to the form

$$p=\rho S^2\psi\left(\frac{S}{C}\right). \qquad (16)$$

When the fluid is nearly incompressible, like water, the compression caused by the impact pressure p will be so slight that it cannot affect the general behavior of the fluid. Hence compressibility may be left out of account and ψ treated as a constant, so that we have

$$S=\text{const}\times\sqrt{\frac{p}{\rho}}. \qquad (17)$$

If p is measured as a head h of the liquid, we have $p=g\rho h$, and equation (17) reduces to

$$S=\text{const}\times\sqrt{gh}.$$

The value of the constant, which cannot be found by dimensional reasoning, is, in practice, $\sqrt{2}$ for a properly constructed tube.

If the fluid is a gas, equation (17) is still applicable when the speed is low. But when the speed is so high that the pressure p causes appreciable compression, $\frac{S}{C}$ cannot be neglected and we must return to equation (16). A form of $\psi\left(\frac{S}{C}\right)$ for high gas speeds may readily be found from thermodynamics, but so many approximations and unproven assumptions have to be made in the course of the argument that the results are not at all convincing.

A NEW NON-FERROUS ALLOY-DIAMOND HARD COPPER

"DIAMOND HARD COPPER" is an alloy of tin and copper, which meets most satisfactorily and successfully suituations and conditions where other bronze alloys, exceptionally hard steels and several compositions which the mechanical engineer can reasonably demand from them. In the many laboratory tests and real service try-outs it has exceeded by over 500 per cent the service rendered by phosphor bronze and babbitt metal as a bearing material, and has been found to be superior to case-hardened steel for bushings, etc. One wonderful attribute of this alloy is that all castings of it are positively free from blowholes.

"Diamond Hard Copper" is a combination of 83 per cent copper and 17 per cent tin alloyed and then treated in the molten state by a secret chemical process. There is an absence of lead, zinc and antimony. It is the only alloy which is absolutely uniform and homogeneous, and the reason for this wonderful result is that the oxygen taken up by the molten metal is kept with the metal completely, instead of combining with only parts of it as an oxide or being taken off as slag clinging to the sides of the crucible, in which state is is almost an oxide. This metal has no slag at any time, either when melting it the first time or in the successive meltings which occur in remelting old and worn or disused castings. This feature has challenged a generally accepted theory that all alloys must have a slag, and that in the remelting of alloys there must be a change in them. "Diamond Hard Copper" does not change in any way by remelting, nor is there any depreciation in the qualities of the castings, regardless of how many times the metal may have been remelted.

The castings are exceptionally sharp, smooth and fine. In cooling the metal expands, and this causes the alloy to fill in the smallest part of the mold fully and completely. Castings which are impossible to achieve with other alloys which have a high tensile strength can be made from Diamond Hard Copper.

The qualities and properties are widely divergent and very valuable. They comprise the following: A tensile strength of 34,000 pounds per square inch; there is no reduction of area at the break, and it displays a sharp crystalline fracture; there is no noticeable elongation; it possesses a compression of, elastic limit 81,000 pounds, fracture 200,000 pounds per square inch. These last two are remarkably high. Its hardness is 143 (Brinel test), which is about the same as annealed carbon tool steel of the quality used for the manufacture of taps, dies, drills, etc. Its coefficient is .033 to start motion on cold rolled steel plate. Its electrical conductivity is about one-fourteenth of pure copper, and its resistance is 140.05 per c.m.f.; but one of its most valuable points in this latter connection is that it is electrically homogeneous. Few metals and alloys possess this property.

In aeroplane work its chief value will be as a bearing material. Mechanical engineers have usually held that one must have a bearing material possessing one of two points. It must either be a material which is soft and would wear away, or it must be of soft particles imbedded in a hard material, that also would give away when required. This being necessary to prevent the damage to the shafting, which is the more expensive to replace. There should be no creation of any galvanic, magnetic or electrolytic action that would grip or seize. Now this Diamond Hard Copper does not establish any of these, nor does it seize, score or grip the shafting or injure it in any way; likewise it will not harm any other parts, such as the housing journal boxes, etc. It recently ran at 1800 r.p.m. for a long period, and at times in this case was very low in oil, but the bearing showed little or no wear, and the shafting or any other part the least injury.

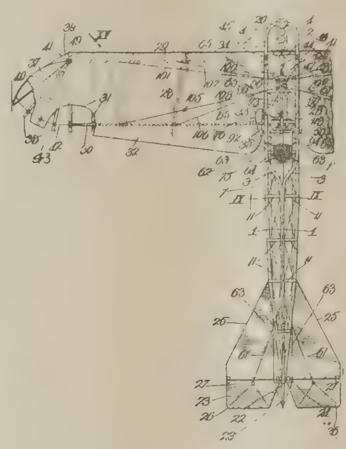
Diamond Hard Copper is displacing case-hardened steel for bushings, linings, thimbles, etc., because it is worked about the same as annealed carbon tool steel. Hence it saves about one-third the labor and time that is required for those made of the case-hardened steel, and in service lasts longer.

The many properties of this alloy have placed the manufacturers in the position that they express themselves as being ready to assist any concern making mechanical devices in the experimenting with this alloy for any uses that may point to its successful adoption. The metal can be obtained in the casting, either machined or in the rough, or can be purchased in the ingot.

RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,153,659. AEROPLANE. John Watts, Kansas City, Mo. Filed July 10, 1912. Serial No. 708,549. (Cl. 244—29.)



1. In an aeroplane, a fuselage, a wing projecting laterally from each side of said fuselage, and cables for operating said wings and connected to the front and rear edges thereof from above and from below, each of the front cables being attached at its opposite ends to the same wing and each of the rear cables being attached at its opposite ends of different wings.

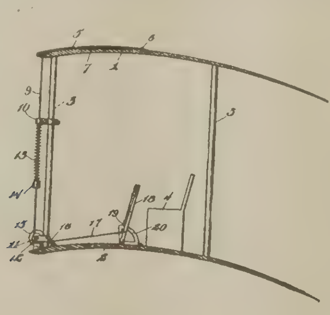
2. In an aeroplane, a fuselage, a wing projecting from each side of the fuselage, a plurality of cables connected to said wings from above and from below and suitably guided upon the fuselage, the lower portions of the cables extending at greater angles to the wings than the upper portions, and means engaging said cables to shift the wings, said means including provision for taking up and paying out the lower portions faster than the upper portions of the cables.

3. In an aeroplane, a fuselage, a wing projecting laterally from the fuselage at each side thereof and capable of swinging in a vertical plane, suitably guided cables, each overlying one wing and underlying the other and connected at its opposite ends to different wings, and compressed-fluid-actuated means for exerting a downward pull on the said underlying ends of the cables.

4. In an aeroplane, a fuselage, a wing projecting laterally from the fuselage at each side thereof and capable of swinging in a vertical plane, suitably guided cables, each overlying one wing and underlying the other and connected at its opposite ends to different wings, and means for reversely warping the rear portions of said wings simultaneously.

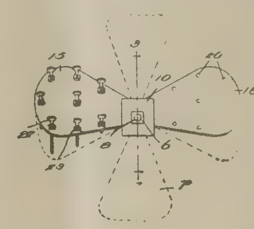
5. In an aeroplane, a fuselage, a wing projecting laterally from the fuselage at each side thereof and capable of swinging in a vertical plane, suitably guided cables, each overlying one wing and underlying the other and connected at its opposite ends to different wings, and means for exerting a downward pull on the said underlying end of one of said cables and an upward pull on the opposite end of the same cable.

1,135,561. SAFETY DEVICE FOR AEROPLANES. Behrend Ulferts, Lakefield, Minn. Filed June 10, 1914. Serial No. 844,280 (Cl. 244—29.)



1. A flying machine having a supporting surface, a safety vane pivoted at its rear edge upon the upper side of said surface for upward and rearward movement to an angle of incidence, means for releasing the holding means, and means for establishing a yielding resistance through said holding means to the movement of the value to an acting position.

1,140,260. PROPELLER-PITCHOMETER. Lawrence Frank, Galveston, Tex. Filed Oct. 21, 1914. Serial No. 867,882. (Cl. 33—174.)



1. The herein described pitchometer for propeller blades, the same comprising a hub member having a pin adapted to enter the hole in the propeller hub, a plate having a series of threaded holes through it, screws through said holes with their tips adapted to contact with the face of the propeller blade, a shank connected with the plate, and adjustable connections between the shank and hub member whereby the position of the plate with respect to the blade may be changed.

2. The herein described pitchometer for propeller blades, the same comprising a hub member having a pin adapted to enter the hole in the propeller hub, a plate having a series of pendant elements adapted to contact with the face of the propeller blade, a support for the plate, and movable threaded connections between the support and hub member whereby the position of the plate with respect to said member is rendered adjustable.

3 In an instrument of the class described, the combination with a hub member comprising a lower block with a beveled upper face, a pin depending from said block, an upper block with a beveled lower face, and means for drawing said blocks toward each other; of a plate having a shank adapted to be clamped between said beveled faces and a series of holes through its body, and set screws through said holes, for the purpose set forth.

4. In an instrument of the class described, the combination with a hub member consisting of a lower block having a beveled upper face and a tubular pin projecting from its lower face, an upper block having a beveled lower face and a hole through its body, a bolt extending through said hole and through the lower block and pin and having a reduced head at the lower end of said bolt; of a jam nut on the upper end of said bolt; of a plate having a shank adapted to be clamped between said beveled faces and a series of holes through its body, and set screws through said holes, for the purpose set forth.

5. In an instrument of the class described, the combination with a hub member consisting of a lower block having a beveled upper face and a tubular pin projecting from its lower face, an upper block having a beveled lower face and a hole through its body, a bolt extending through said hole and through the lower block and pin and having a reduced head at the lower end of said pin, and a jam nut on the upper end of said bolt; of a plate conforming in contour with the propeller blade and having an offset shank pierced with a hole and adapted to pass over said bolt, and a series of adjustable elements on said plate adapfed to contact with the face of the propeller blade.

FOREIGN NEWS

AUSTRIA

An aerial battle was reported, in a late official communication, to have taken place in the Czernowitz region, in which the Russians lost a war plane. The Russian squadron consisted of seven aeroplanes, four of which were of the large fighting type. On their appearance, says the statement, "several Austro-Hungarian flyers arose and gave battle, and after a combat of two hours in the air shot down one battle plane at a distance of thirty feet. The enemy squadron then fled. A damaged aeroplane landed near Boyan, between the Russian and our lines. It was destroyed by Austro-Hungarian artillery fire."

FRANCE

Last week, Adjutant Navarre, who has accounted for seven German aeroplanes, was in the air twenty-four hours in three days. He seems to sit in his machine as a good horseman sits on his horse. He handles his machine gun in such a way that to load it he has to let go the levers of the aircraft. When it was mentioned that this was dangerous he answered:

"Possibly, but it is more convenient."

A few days ago Adjutant Navarre fought five Fokkers single handed.

"They were fairly far off," he said, "to the right and left, and before and behind. I made sure that my baby (a fast aeroplane) was well in hand, and I did some tricks to amuse them.

"Suddenly, as if at a given signal, all five bore down on me. I waited for them. Then I made three little loops and came up behind two Fokkers. Naturally I let drive at them. The others dared not try to snipe me for fear of hitting their own pals. It was extremely funny."

GERMANY

The Zeppelin plants in Germany are now completing two airships a week, and are testing them over Lake Constance. The finished Zeppelin moves off its staples and is brought to the large "harbor" for airships near St. Galles, Switzerland. From there it makes its trial flights. Meanwhile work goes on uninterruptedly on two other new airships, which grow in magic fashion. The test trials, it seems, are no longer mere distance trials, but purely and simply war maneuvers. The form and dimensions of the Zeppelin have altered considerably from the original types. The latest models are much longer and thinner—more fish shaped—than before, and the two cars hang lower from the body of the airship, apparently without the usual connection between them, unless a passage has been built into the gigantic body itself. The cars are armored, and each carries at least six machine guns and a cannon or two, besides special apparatus for bomb throwing and for the discharging of air torpedoes.

The newest Zeppelin is labeled L Z 95, and from the fact that there is another series labeled only L, it is concluded that the number of German airships is well over 100.

On April 10 bombs were dropped by squadrons of German aeroplanes on the railroad stations at Pogorjelzy and Horodzieja, on the line to Minsk (Russian front), and on the camp at Ostrowki, south of Mir. Bombs also were dropped on railway establishments at Minsk by a German airship, and army and naval airships during the night attacked docks at London and other important military points on the English coast and also Dunkirk.

The German Passenger Airship Company, Ltd., of this place, in its annual report just issued says that while the war has put a stop to the company's regular business, the wroks have been fully occupied on war orders (manufacture of parts for Zeppelins) and that the gross earnings for the year were $175,000. As the company was burdened with a heavy deficit, 1915 earnings made it possible to write off a substantial amount. The company has also derived revenue from leasing its sheds at various points like Baden-Baden, Hamburg, Frankfort, Dresden and Potsdam to the military authorities.

GREAT BRITAIN

Interesting stories told by Dutch sailors who have just returned to Holland from England, regarding the series of Zeppelin raids between March 31 and April 4 are contained in dispatches from Rotterdam.

"Especially Leith, Hull, Sunderland, Newcastle and Grimsby," the dispatches say, "suffered serious damage. In Leith harbor, a British ship with four masts was destroyed. At the railroad station a train was struck. A big distillery was hit by an incendiary bomb and burned to the ground.

"A bridge over the Tyne near Newcastle was partially wrecked.

"At Grimsby the barracks were demolished, several hundred soldiers being buried beneath the ruins.

"The Dutch sailors say that recently a large number of French anti-aircraft guns, together with detachments of French officers and men, arrived in England."

Starting out from a British naval base "somewhere in the Aegean," three British aeroplanes flew to Constantinople, April 14, and bombarded a powder factory and aeroplane hangars in the Turkish capital. Despite wind, rain and thunderstorms, all three returned safely, having achieved the greatest aerial feat of the war, so far as distance is concerned. The flight to Constantinople and back covered a distance of more than 300 miles. At the same time another British seaplane flew to Adrianople, where bombs were dropped on the railway station. This machine, too, returned unharmed.

The Turkish War Office admitted in a statement that "villages near Constantinople" were bombarded "unsuccessfully" by two enemy aeroplanes, but made no mention of the attack on the hangars in the capital itself.

The raid was the second substantial achievement of the new type of British naval planes since the outbreak of the war. The other instance was the feat of five seaplanes flying across the North Sea and bombarding the "home" of the German aeroplanes at Schleswig, east of the island of Sylt.

It is the opinion of Major-General Sir Frederick Benson, attached to the British War Office as head of the remount department of the British Army for British America, that air flights will eventually end the war. In a letter made public by Colonel William Hamilton Merritt, treasurer of the Canadian aviation fund, Sir Frederick writes: "I have been watching closely the small items of news that one gets from the firing line, and I am more and more convinced of the vast importance of training of aviators. **The decisive actions of this war will be in the air.** When the German navy does show itself, it will be accompanied by clouds of sea planes and Zeppelins."

In a statement issued on April 13, the Premier, Mr. Asquith, denied that the number of deaths caused by Zeppelin raids had been kept from public knowledge. He was asked in the House of Commons by Mr. Noel Pemberton-Billing whether it was with the consent of the government that "the actual number of deaths from Zeppelin raids has been withheld from the public."

"The exact figures have been collected by the police and published," Mr. Asquith replied.

Official statistics of casualties have been given out after the Zeppelin raids, but the statement has been made unofficially, particularly by travelers returning to the United States from England, that the actual number of deaths has greatly exceeded the totals given by the British authorities.

A special dispatch from London says that Premier Asquith has accepted the resignations of the Earl of Derby as Chairman and Lord Montagu as Vice Chairman of the Joint Naval and Military Board in control of the aerial service.

Among British aviators, the German, Immelmann, is fast acquiring the reputation of being the most daring and efficient of the Kaiser's airmen. Two of the British prisoners of war were recently questioned regarding their opinion of him. They spoke with more liveliness than is customary with the English temperament. Immelmann, they said, was near their aerial district, and they admitted honestly that he was a problem for them. His aeroplane was unexplainably fast and flexible, and had a strange habit of bobbing up just where one had hoped to make surprise attacks. This man and his machine were thorns in the flesh of the English fighting air camp.

Upon being asked if they knew how many aeroplanes Immelmann had brought to earth, they said that they remembered eight, believed the number might be ten, but thought that thirteen was an exaggeration; but, anyway, they said, it made no difference. For every aeroplane shot down one would be built in England and a dozen new fliers trained; perhaps some day an English Immelmann would arise.

ITALY

The official report of the Government, issued by the General Staff on April 13, describes operations designed to keep Austria from withdrawing her forces to aid in the German attack on Verdun. The report follows:

"Austrian aerial squadrons in several attacks endeavored to destroy Italian lines of communication and also to drop bombs on the unfortified cities of Ancona and Udine. But the Italian anti-aerial artillery and airmen were able in five days to beat down eleven enemy aeroplanes. Moreover, an Italian dirigible in a raid upon Austrian territory threw about 800 kilograms (1,760 pounds) of explosives upon the railroad junction of Opcina, while six Caproni aeroplanes threw forty bombs on the station of Adlesberg, all returning safely."

JAPAN

While making an extended flight on March 24, the Japanese naval hydroaeroplane, with Sub-Lieut. Abe and Engineer-Lieut. Tongu as occupants, was wrecked and both occupants were killed.

"When the news reached the palace, the Emperor was pleased to forthwith despatch Rear-Admiral Matsumura, Naval Aide to His Majesty, to the scene of the accident. The Rear-Admiral, accompanied by a naval adjutant from the Navy Department, drove to the place in an Imperial carriage, and after having gone over the scene and learning all the details of the accident, reported to His Majesty at 4 o'clock. Admiral Kato, Minister of the Navy, paid a formal call at the residence of H.I.H. Higashi Fushimi, close to the house where the machine fell, and expressed his hopes that His Highness had not been upset by the catastrophe. On his way back, he visited the scene and returned to the Navy Department at 4:30. The remains of the two unfortunate officers have been removed to the Naval Club where they will be watched throughout the night by a Naval Guard of three officers from the Flying Corps and forty-five of the ill-fated lieutenants' classmates. The families of both men will also spend the night there. At 9:30 this morning, the remains will be carried on a naval pinnace to Yokosuka Admiralty, where the funeral will take place."

RUSSIA

Near Chotin, on the morning of the 12th, an enemy aeroplane from the direction of Boyan was attacked by Russian aircraft and compelled to retreat. Meanwhile another enemy aeroplane succeeded in reaching Ivantz, on the Dneister opposite Chotin, and threw bombs the exploding of which wounded sentinel Anatole Postavneff. Hearing of this the Emperor, who was reviewing the troops at Ivantz, ordered Postavneff decorated with the fourth class order of St. George.

By way of London comes a report telling of an attempt on the Czar by Austrian and German aviators. Learning that the Czar was reviewing his troops at Ivantz, on the Dniester, two Teuton aeroplanes set forth with a supply of bombs. When the machines reached Chotin, across the Dniester from Ivantz, Russian machines ascended to meet them. A furious battle in the air followed, in the course of which the Russian aviators forced one of the hostile planes to retire. The other aviator managed to get past. Soaring across the Dniester, he descended to lower altitudes above Ivantz and succeeded in dropping his store of bombs. Petrograd reports that only a sentinel was injured.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
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c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

National Model Aeroplane Competition Held Under the Sanction of the Aero Club of America

To encourage the hundreds of young men interested in aviation and to induce participation as well as experimentation, the Executive Board of the Aero Club of America has offered prizes amounting to $695 for flying competitions of small model aeroplanes driven by compressed air.

The National Model Aeroplane Competition was instituted last year by the Aero Club of America to encourage the efforts of thousands of young men all over the United States who are beginning their activity in aeronautics by flying and experimenting with aeroplane models. The Wright Brothers became interested in aeronautics through a tiny model aeroplane, and carried out their earliest experiments with just such models as are being flown by thousands of young men all over the country today. Among the members of the twenty Model Aero Clubs throughout the country there may be geniuses who may evolve new and better types of air craft, or features which will improve the existing types. Therefore, the large Aero Clubs are offering special inducements in the form of cash prizes to direct their efforts and interest in proper channels, realizing that anything done now to interest the younger generation in aeronautics will hasten the coming of the Age of Wings.

The splendid silver trophy presented by Mr. Henry S. Villard for competition between the Model Aero Clubs of America. The cup is now in possession of the Illinois Model Aero Club which club scored the highest average in the National Model Aeroplane Competition of 1915

There are over twenty Model Aero Clubs throughout the country, all of which will participate in the National Model Aeroplane Competition.

Cash prizes, amounting to $100 monthly, offered by the Aero Club of America, from the National Aeroplane Fund, will be awarded to the individual members of the various Clubs making the best records each month. The Villard Trophy, donated by Mr. Henry S. Villard, will be awarded to the Club whose members collectively make the largest score during the three months—this to be computed by the point system. Last year the Villard Trophy was won by the Illinois Model Aero Club.

A Club becomes the owner of the trophy when it has been won for three consecutive years by its members. The rules governing the winning of the trophy will be progressive in accordance with the progress made in model flying.

Flying model aeroplanes is a science, to master which, requires knowledge of the fundamental laws of aerodynamics and general aeroplane construction, besides considerable practice. Two models, apparently alike in every respect, say two feet long, with two propellers of the same size and the same length of rubber which, when twisted supplies the motive power for the propellers, will behave quite differently when launched into the air. One may go 3,000 feet and as straight as an arrow; the other may go only a hundred feet and make a circle. The difference may be due to a number of causes, including the shape or tilt of the wings, the misplacing of the center of gravity, the pitch and size of the propellers, etc.

Rudy Funk Speed Model

Aero Science Club of America

It was proposed to hold an election of officers at the last meeting of the club, but in view of the fact that representatives of the Club had to be chosen to represent the Club in the first contest of the National Model Aeroplane Competition, it was decided to postpone the election until the coming meeting, April 22. Those chosen to represent the Club and who will compete at Garden City April 23, were Charles Meyers, Frank Bloomfield, Egbert P. Lott, Wallace A. Lauder, Rudolph Funk and Fred Thiele. Representatives of the Aero Club of America have been requested to officiate at this contest. At the last meeting of the Franklin School Model Aero Club Mr. Cavanagh was present. Secretary, 29 West Thirty-ninth street, New York City.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Done

"Well," said the doctor, "you're cured at last. How do you feel?"

"I feel," said the aviator, looking at his wallet sadly, "I feel as if I could start life all over again."

Jerry (1st mechanic): I have traced my ancestry back to an Irish king.

Pat (2nd mechanic): Sure that's aisy. What chanst has a dead man to defend himself?

A Never-Failing Supply

The manager of an aeroplane company was seeing his wife off with the children for a vacation in the country. As she got into the train he said, with the fondest of expressions, "But, my dear, won't you take some fiction to read?"

"No sweetheart," returned the wife. "I shall depend upon your letters from home."

Making the Target

An aerial sportsman who recently returned from Ireland relates the following incident:

Two Irishmen arranged to fight a duel with pistols. One of them was distinctly stout, and when he saw his lean adversary facing him he raised an objection.

"Bedad!" he said, "I'm twice as big a target as he is, so I ought to stand twice as far away from him as he is from me."

"Be aisy now," replied his second. "I'll soon put that right."

Taking a piece of chalk from his pocket he drew lines down the stout man's coat, leaving a space between them.

"Now," he said turning to the other man, "fire away, ye spalpeen, and remember that any hits outside that chalk line don't count."—*Lippincott's.*

The Last of the Gate Receipts

First Doc: What did you treat that man for?
Second Doc: Fifty dollars.
First Doc: No, I mean what did he have?
Second Doc—Fifty dollars.—*Brunonian.*

Examination Closed

Fallen One: Officer, did you see me fall?
Officer: Yes.
Fallen One: Have you ever seen me before?
Officer: No.
Fallen One: Then how did you know it was me?—*Harvard Lampoon.*

Keeping Up Appearances

"How about some hair tonic?" suggested the barber.

"What for?" inquired Mr. Growcher.

"So as to preserve your hair, of course."

"Let it fall out. I'm too old to be handsome, and my only hope of looking intellectual is to become bald-headed."

"What do you charge for your rooms?"
"Five dollars up."
"But I'm an aviator."
"Then it's five dollars down."

Old Gentleman (engaging new air pilot): I suppose I can write to your last employer for your character?

Air Pilot: I am sorry to say, sir, each of the last two gentlemen I have been with died in my service.

Some Lawyers

Some lawyers would insure an aeroplane after the tank blew up and then ring in a nunc pro tunc clause on the insurance company.

Home, Sweet Home

Aviator (at the door): Is my wife in?
Butler: No, sor.
Aviator: Ah! Then she got word that I was coming.

Business

"Jack, I wish you'd come to see me occasionally."

"Why, Vanessa, I thought you were engaged to Flight St. Algernon Fitzwhistle?"

"No; but I think I could be if I could organize a little brisk competition."

An Easy One

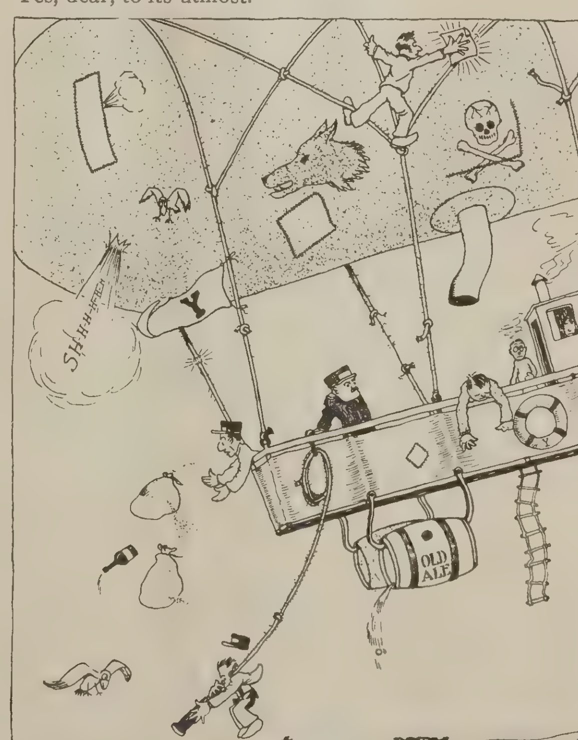
Rural Bystander (to aviator who had started out on a short spin): What would you do if that car should suddenly start to go while you was under it?

Desperate Aviator: Do? Thank Heaven!

"He's so reckless he's always taking chances.
"Oh, do send him to our charity bazaar."—*Baltimore Sun.*

"Isn't the Government perfectly horrid over the income tax," said the aviator's wife. "I suppose your husband's income is taxed too."

"Yes, dear, to its utmost."



The Cruise of the Yale Aërial Corps

A Patriotic Service

Amongst that body of New England citizens who have been prominently associated with practical activity for aerial preparedness, Mr. Godfrey L. Cabot has been most active. He has endeavored to have the authorities in Washington informed upon matters of which they should be cognizant, and below we reproduce a letter sent by him to the Secretary of War. We hope Secretary Baker will make a note of the facts presented:

"Shortly after the outbreak of the European War the French discarded 558 aeroplanes out of something over fifteen hundred they had at the beginning of the war.

"They discarded all of the following types: Bleriot, Deperdussin, Nieuport and R. E. P., and adopted certain standard types of strong standardized simply constructed machines, equipped with powerful and reliable motors.

"For the ordinary two-passenger Voisin biplane they use a 150-hp. engine of the Nieuport, similar in construction to the German Mercedes.

"They have also large aeroplane repair vans, carrying from place to place an adequate supply of tools and repair parts. Our present experience in Mexico is a repetition on a small scale of their experience with weak and inadequate machines, and brings home to us the vital necessity of following their lead in this matter and adopting stronger machines of standard types and a minimum variety of parts, equipped with motors of at least 140-hp. The conditions in Mexico are unfavorable to the maintenance of aeroplanes, but nevertheless such as to make aeroplanes of primary importance in present operation. The difficulties encountered are, first, that it requires approximately 35 per cent more power to fly and 35 per cent more speed, which makes the starting and landing more dangerous and difficult.

"As they go south the country rises, and these difficulties will correspondingly increase.

"A second difficulty is the irregularity of air currents in the mountainous parts of the country. The third difficulty is frequent local whirlwinds on the immense treeless plains, which constitute the greater part of the surface of the Mexican Plateau. I have been in Mexico as far south as Cuernavaca, and have seen nowhere in that country good or even fairly good roads outside of the large cities. Generally speaking, none such exist, which will make railroad transportation a vital matter in this expedition. I hope that these suggestions will be helpful, and beg to state in conclusion that I have leased the Gooseberry Islands, in Salem Harbor, Mass., to be used as targets in aerial bomb and gun practice, and they are at the disposal of the War Department, as well as the Navy Department, and could be safely used by land planes as well as sea planes in such practice.

"I respectfully urge the immense importance of gun practice and bomb practice in aeroplanes and believe that we can not only profitably follow but also greatly develop methods heretofore pursued in Europe in such practice."

Building Aerial Torpedoes.

Lester Barlow, of Los Angeles, formerly an employe of the Glenn L. Martin Company of the same city, has been at the Frankford Arsenal, Philadelphia, for the last five weeks, engaged in experimental and constructive work on a new and original type of torpedo, which is not only designed for aerial purposes, but can be employed for all other purposes where torpedoes are used. Tests are to be conducted on a war basis in about six weeks. Mr. Barlow says that through the cooperation and encouragement of the government, he has been able to perfect this torpedo, and he intends that the government shall have the exclusive benefit to use it. He will make a commercial sacrifice for the benefit of the nation. Associated with Mr. Barlow in a financial sense is Mr. John Craig, of Los Angeles, Cal. The inventor is a brother of Floyd Barlow, a licensed aviator, who flew for Curtiss in 1912.

Mr. Barlow is also the inventor of an electrical bomb, which has passed the tests of the Russian, French and Italian governments, and the Minister of Inventions at London.

Invents a New Aeroplane

George Ellithorpe, of Marblehead, O., has invented a new aeroplane which he expects will simplify some of the problems in aeronautics. He has been working on his models since 1911.

Foresters of Montana Discuss Aeroplanes

At a forestry meeting held at Billings, Mont., a few days ago, the foresters discussed the advantages of using aeroplanes, and the consensus of opinion was that the work could be done more economically and that fires could be extinguished with less loss of timber if the forests were patrolled with aeroplanes.

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Sturtevant Aeroplanes for General Pershing

On March 30th, 1916, Secretary Baker made arrangements to supply General Pershing with more aeroplanes for use in Mexico and authorized the immediate purchase of eight tractor biplanes. On the evening of the 30th the Sturtevant Aeroplane Co., of Jamaica Plains, Mass., received a telegram from the War Department for four steel battleplanes, delivery to be made upon same within thirty days from receipt of order.

The experienced engineering organization of the Sturtevant Aeroplane Co., together with large manufacturing facilities, enabled them to complete the first aeroplane within one week from receipt of order. This machine was shipped direct to Newport News, Va., there to undergo the official U. S. Government trials.

The Sturtevant steel aeroplanes were designed and developed by Mr. Grover C. Loening, Vice-President and General Manager of the Sturtevant Aeroplane Co., working in conjunction with the War Department experts. A number of exhibition tests on this new type of aeroplane were conducted during the past winter by Lieut. Byron Q. Jones, U. S. A.

These machines are particularly adapted for use in Mexico where flying conditions demand an aeroplane with a large amount of power, a wide range of effective speed, together with a large climb and load carrying capacity.

The improved 140 h.p. Sturtevant aeroplane engines have been installed in these machines. These motors are equipped with gravity feed carburetors and aluminum water jacketed inlet manifolds, the water jackets being cast integral.

Among those present at Newport News during the Government tests of the first machine were Mr. G. C. Loening and F. C. Channonhouse, of the Sturtevant Aeroplane Co., and Mr. H. E. Morton, chief engineer of the B. F. Sturtevant Co.'s aeroplane motor department, of Hype Park, Mass.

The Mexican Situation

The past week has been perhaps the most eventful in the way of experiences for our First Aero Squadron in Mexico—the experiences ranging from being stoned by Mexican citizens to breaking army records for sustained flights.

All previous records for sustained flight in the army aviation service were broken on April 11, when an army biplane carrying Lieuts. Edgar S. Gorrell and H. A. Dargue arrived at Columbus, N. M., after a 350-mile flight in four hours from Gen. Pershing's headquarters in Mexico.

The best previous cross-country flight for the army service was made by Capt. Dodd, of the Signal Corps, who flew approximately 260 miles from the army aviation school at San Diego, Cal. Before that the record was held by Lieut. Milling, who flew from Galveston to San Antonio, a distance of 220 miles, without alighting.

When the news of the flight was given to Brig.-Gen. Scriven, chief of the Signal Corps of the army, over the telephone he said:

"I trust that this achievement, made under the most adverse flying conditions due to the altitude at which it had to be made, will serve somewhat to correct the unfair impression created throughout the country by the newspapers' accounts of the shortcomings of the army fliers in Mexico."

The aviators reported that rumors were current in Mexico that Francisco Villa was dead, shot by a civilian defending his home.

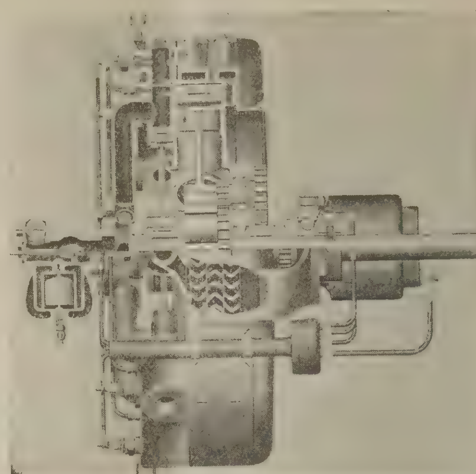
"There seems no doubt that Villa was wounded," said Lieutenant Dargue, "conversations with natives and with physicians having convinced me that he was shot through both legs, one of them being broken by a bullet, while another shot lodged in his stomach. A man in that condition, without medical attention, could scarcely live long."

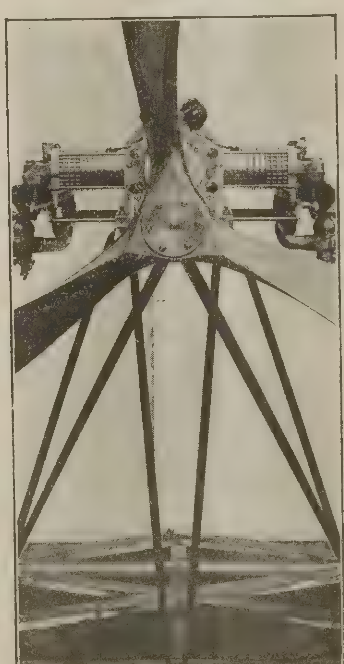
Before the arrival of the guards, however, he said, both he and Captain Foulois were annoyed by crowds of small boys who threw rocks at the machines and called them "gringoes."

The aviator explained that this spirit was not shown by any except the lowest classes, and that afterward they were shown every courtesy. The Carranza Chief of Staff invited them to his home, purchasing candies and tobacco for them to carry back to the American troops.

The local daily paper also spoke favorably of the expedition, and urged that every hospitality be shown to the American air scouts.

Word was received at military headquarters that Lieutenant-Colonel Rivers, who had been dangerously ill at Casas Grandes with pneumonia, is on the road to recovery.





Art Smith in Japan

According to the lengthy reports in the Japan *Times*, Art Smith is having a very successful visit in Japan.

"The aviator was so enthusiastic over the warm welcome he received here," says the *Times*, "that it took no small amount of persuasion to draw him on to the subject of aviation.

Smith has with him two aeroplanes and eleven "baby" automobiles—of the type which Art is much given to manipulating himself. After making the ten flights which he has contracted to make, Mr. Smith will return to San Francisco.

Soldier Gift to National Aeroplane Fund

Brigadier-General R. K. Evans, commanding at Laredo, Texas, has sent $137.15 to the National Aeroplane Fund, which represents the contributions of the officers and enlisted men of his force to the fund being raised by the Aero Club of America for training civilian aviators and militia officers, and procuring aeroplanes for a reserve to make up the deficiency now existing in Mexico. In sending the money, General Evans wrote:

"I enclose check for $137.15 contributed by the garrison of Laredo, which is composed of the headquarters of the Second Brigade, the Ninth Infantry, Battery E, Sixth Field Artillery, and the Third Squadron of the Fourteenth Cavalry. This sum is made up of contributions ranging from 5 cents to $10. Of this sum, officers contributed $58.50 and enlisted men $78.65.

"It is sent to you in recognition of our appreciation of the great work which the Aero Club has done in creating and stimulating knowledge and interest in the very important and much neglected question of military aeronautics."

The Governors of the Aero Club, who have written General Evans in appreciation of the gift, announced yesterday that a contribution of $100 had been received from the Duchess de Talleyrand, who was Miss Anna Gould of this city.

National Coil Company Puts on Night Crew

To meet the requirements imposed upon them by the large demand for their product the National Coil Company finds it necessary to put on a night force.

The prospects for a large business being assured by the success of their small high tension magneto, also make it necessary to anticipate means to increase their plant.

At present, however, the addition of a night force will relieve conditions, and while no definite action has been taken toward additional buildings, they are in contemplation for the near future.

The new machinery ordered is arriving and is rapidly being set and additional help put on to operate it.

With the orders now on hand a steady and increasing production will be needed for the next twelve months.

(*Continued from page* 182)

Coffin instanced certain testimony given before a special board in Washington, during which, in speaking of the modern military rifle, the expert witness stated that in the manufacture of the new model Springfield rifle, the receiver alone, which contains the bolt and firing mechanism, requires 120 separate and distinct operations before it is finished, which means that 120 gages must be prepared before this part of the rifle can be made. Furthermore, these gages, because of the wear due to abrasion, can be used only for from 8,000 to 10,000 gagings—they must then be scrapped.

Mr. Coffin is of the opinion that as the result of the placing of orders for munitions for our Army and Navy among the large number of firms that will be selected throughout the country, there will be a valuable return to the Government in the way of useful suggestions by the engineers of the various works for the simplification and improvement of the plans and specifications.

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Sworn to and subscribed before me this 1st day of April, 1916.

G. Douglas Wardrop, Business Manager.

Elise Gilman,

Notary Public, Westchester County.

(Seal.)

Certificate filed in New York County. No. 7197. New York Register Number, No. 221.

(My commission expires March 30, 1917.)

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AERIAL AGE WEEKLY

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VOL. III NEW YORK, MAY 1, 1916 No. 7

Aero Club Endorses Plan for Separate Air Service

WRITING to Secretary of War Baker, Mr. Alan R. Hawley, President of the Aero Club of America, endorses Secretary Baker's plan to separate aeronautics from the Signal Corps and makes additional suggestions, as follows:

"To improve Army air service, following steps should immediately be taken:

"(1) Separate aeronautics from the Signal Corps, as proposed by Secretary Baker.

"(2) Equip two aero squadrons, allowing three aeroplanes to each aviator, as is done in Europe. There are enough Army aviators to operate two squadrons, which are badly needed at the Mexican border.

"(3) Establish six well-equipped aviation schools in different parts of the country for training two hundred aviators. As the Army cannot supply 200 officers for this purpose, Secretary Baker's plan to enlist Militia and civilian aviators in the Army should be adopted. To meet the need for trained aviators for the Mexican campaign the Aero Club of America has arranged to train fifty Militia officers of different States and civilian aviators. The number increases as fast as funds are subscribed to the National Aeroplane Fund.

"The course given is the regular civilian course, which qualifies them for their pilot certificate, but is not sufficient to make them military aviators. To do that requires several months of further training in a military aviation school, under the supervision of expert military aviators.

"Each of these six aviation schools should have between 600 and 1,000 acres of flat land, with hangars for 24 aeroplanes, buildings for workshops, machine shops, motor shops, storerooms, officers' quarters, and barracks for 200 enlisted men.

"The selection of the locality for these aviation schools should be decided from the standpoint of weather, transportation and proximity to other flat fields, so that the aviators may not meet with disaster if they are forced to make a landing. Nearness to water is also desirable, so that hydroaeroplanes may be used by aviators who are trained especially for coast defense. A number of these schools should be located out of reach in case of foreign attack; but in view of the advantage afforded by having aviation schools along the seacoasts, this last condition is not important, while it is important to establish aviation schools at coast military centers.

"(4) Provision should be made for equipping at least eight aero squadrons this year. All this can be done in the coming twelve months provided Congress allows $5,000,000 with which to do it."

An Aviation Plattsburg?

THE people connected with the inner circle of aeronautics were elated to learn recently of the possibility of there being established a Summer aviation camp for business men. Details of the plan, however, were withheld from publication.

When a Curtiss military tractor was delivered at Governors Island as the first unit in whatever plan is to be carried out, some of the New York newspapers sought to get details regarding the plan, and as a result one of the papers printed the following:

"A plan is on foot to form an aviation school to train army fliers at Governors Island. The first inkling of the project became known yesterday when a brand new Curtiss biplane made its appearance in the hangar on the island, supplemented by the unofficial information from headquarters that two more, an aeroplane and a hydroaeroplane, are to be brought there within a short time.

"Backing the plan are New York men interested in strengthening the aviation arm in the movement for preparedness. P. A. Carroll, a lawyer at 59 Wall street, and W. Redmond Cross, of the firm of Redmond & Co., are leaders in it. Mr. Carroll admitted yesterday that the intention is to form a training school on the island if possible, but added that the plans are only tentative so far.

"The future will depend on a number of things. Governors Island may not be suitable in atmospheric conditions or other requirements, in which case the school may be set up on Hempstead Plain or some other available spot. It is understood an attempt is to be made to raise a fund sufficient to pay for the instruction of applicants, who will be chosen on the Plattsburg plan. If this is not a success the school may be run for those who have the means to pay for instruction.

"The machine now being assembled is a Curtiss JN type military scouting tractor, with a 90-horsepower OX motor. It has a dual control system suitable for instruction. Steve MacGordon, ranked among the best of the Curtiss instructors, will come to New York tomorrow from Newport News to test out the machine and also to investigate conditions about the island which may have a bearing on its adaptability for a school. Either MacGordon or Philip A. Bjorklund, another Curtiss instructor, will be in charge of the school if it is formed.

"The army men at the headquarters of the Department of the East are heartily in favor of the plan. It has long been held by them that the reconstructed parade ground, which was built up from the sea, forms the best possible landing and training grounds for a flying school."

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

American Aircraft Best

MR. HENRY WOODHOUSE, Governor of the Aero Club of America, addressed a special luncheon meeting of the Aldine Club on Tuesday of last week. Among other things, he said:

"Great improvements have been made in American aeroplanes and motors, in the past eight months, and American aeroplanes and motors are now considered equal, and in some respects, better, than the European products. Officers of different Governments told me recently that the reason they placed orders in the United States was because we are continuously improving our types, and we are producing types of aircraft which cannot be equaled. As an instance, Europe tried to copy the flying-boat of the "America" type, but did not succeed. Had they succeeded, they would have found that while they were trying to equal that type we had developed the "Super-America," which is a far more efficient type. While the "Super-America" was being considered in Europe, we developed a huge aeroplane capable of lifting 15 tons, and which it is stated the European manufacturers could not undertake to copy.

"The same has been true of motors. When the supply of Krupp steel was exhausted a little over a year ago, makers of aeronautical motors had to face a very serious problem. They got steel that was equal to the Krupp in many ways, but for several months only one out of ten crankshafts turned out was flawless. But that problem was soon solved, and to-day American aeroplane motors are equal to the very best aeroplane motors, and in a very short time there will be on the market motors of as high as 300 h.p. Some motors of 250 h.p. are now being tested and are giving good results. The services rendered by the scouting aeroplanes in Mexico are in themselves evidence of the excellence of American motors. As soon as the air corps was put in action in connection with the punitive expedition the machines were equipped with some of the improved motors, and the results show that these motors gave better service than any European motor could have given.

"As a matter of fact, no European commander would have dared to meet such a situation with such a small number of aeroplanes as our punitive expedition had at its disposal. Seeing that a well-equipped aviator is worth a thousand soldiers in war, European countries allow three aeroplanes for each aviator, so that if the least trouble develops the aviator has another aeroplane ready for him."

Mr. Woodhouse added that the War Department's estimates for Army aeronautics for next year are not large enough to even put thirty aeroplanes in commission.

Aerial Preparedness

(Editorial in Grand Island [Neb.] *Independent.*)

UNQUESTIONABLY in aerial preparedness lies one of our country's greatest needs. Under-sea craft also deserves much attention, though its usefulness may be limited by the present war and America's attitude toward submarines; that depending, of course, on the final outcome not only of the present contentions of this government with Germany but also upon what international agreements may be made after the war.

But as to air craft there is no dispute, thus far. And in view of the fact the following, by the editor of *Flying,* a periodical devoted to aircraft, will be interesting and instructive:

That the American Eagle needs wings—a substantial aeronautical service—is a matter in which both preparationists and pacifists agree. It is about the only thing on which the different factions of the present Congress do not disagree, and the only reason why the military programs proposed for this year do not include an appropriation of $25,000,000 for aeronautics is undoubtedly that the shortage of officers in the army would make it impossible to get the necessary officers.

Coming down from what ought to be to what is, we find with a shock that there are only eight aeroplanes available for service at the Mexican border, at a time when 100 aeroplanes could quickly do the work which it may take 25,000 soldiers to do. It is evident from the statement of General Funston that a large number of aviators are needed as soon as operations begin. Only aviators can scout over Mexican territory with little danger. Others, General Funston states, will face death.

The Secretary of War has ordered General Scott to instruct General Funston to use as far as possible the squadron of aeroplanes of the army. This consists of eight biplanes, equipped with 90-horsepower motors, which, on account of their low power, could not climb fast enough in case of emergency, the Mexican atmosphere being so rare as to require high-powered aeroplanes.

Mr. Allan R. Hawley, president of the Aero Club of America, at 297 Madison avenue, New York City, very aptly summarizes the need thus:

An immediate appropriation of $1,000,000 to at once properly equip four aeroplane squadrons with the necessary high-powered aeroplanes may save the lives of 10,000 American soldiers on the Mexican border. There should be three aeroplanes available for every aviator now at the Mexican border, which is the number of aeroplanes allowed to each aviator in Europe, and three more squadrons should also immediately be put in readiness. A hundred high-powered aeroplanes would make it possible to round up Villa and his band, in a very short time, where it might take thousands of men a long time with considerable losses to attain the same end.

Every aeroplane being worth a thousand soldiers in the Mexican campaign, the Aero Club of America is mobilizing the licensed aviators available, equipping them with high-powered aeroplanes, and keeping them in readiness to answer the call of the War Department, which will gladly avail itself of this reserve in case of need. It will cost between $400 and $750 to train each aviator, and $8,000 or $10,000 each for the high-powered military aeroplanes.

Eight trained aviators have already been mobilized, and are being trained on high-powered aeroplanes. One hundred thousand dollars is now being raised by public subscription to buy suitable military aeroplanes, which will be turned over with the aviators to the War Department, to be given to the militia of different states after the Mexican campaign.

The officers of the club are quite frank in stating that Congress should be the agency to do this. But they realize that if they wait for Congress to do its duty, they may find that thousands of American lives will be lost first for lack of adequate protection. There are no funds available at present for this purpose for the army, and the next appropriation, not yet sanctioned by Congress, will not become available until June 30.

The most unfortunate situation is also that the army is so extremely short of officers for all branches of the service that it cannot increase the air service without hampering other arms. Last year Congress allowed sixty officers for aviation, but it was impossible to obtain them. Until Congress authorizes a substantial increase of the army, the only relief can be had by equipping the militia with aeroplanes, and that is what the National Aeroplane Fund was instituted to do.

Unfortunately, the navy is no better off. It has only about a dozen aeroplanes available, and twenty or so ordered, many of which will be needed to replace the machines which are now in commission.

In the short period of eight months the Aero Club of America has succeeded in supplying funds for twenty-four states to begin to organize aviation detachments in the militia. In some states, as in the case of New York, the National Guard and the First and Second Battalions of the Naval Militia have already been presented with aeroplanes and means for training aviators. The American Eagle is growing wings—but money raised through public subscriptions, not appropriated by the nation, is paying for their growth.

The News of the Week

Brindley to Make Transcontinental Flight

On May 15th, Oscar A. Brindley, who won the Curtiss Marine Trophy last summer, will attempt what military aviators predict will be the most remarkable flight in the history of aeronautics. Accompanied by A. J. Macy, a Chicago electrical engineer, inventor of the Macy Electric Autoplane Stabilizer, he will start from San Francisco to New York with the control wires of their aeroplane sealed. Mayor Capps of San Diego will officially seal the stabilizing controls of the aeroplane, and upon reaching New York Mayor Mitchel will be requested to break the seals. Mr. Brindley plans to reach New York on May 21, spending thirty-five hours in actual flight.

Mr. Macy says that the transcontinental aerial voyage will be made for the purpose of demonstrating to representatives of the United States, British and French Governments, the utility of the electric stabilizer. The aircraft to be used on the flight was designed jointly by Brindley, Macy and Glenn Martin. It will have a speed of 115 miles an hour and will be fitted with a special landing gear permitting the aeroplane to skim along a road like an automobile.

The fuselage is so fitted that a pontoon can replace the land gear in five minutes, thereby converting the machine into a hydroaeroplane.

Upon arrival at New York, Mr. Brindley plans to smash a number of world records with the new machine. The route to be followed on the transcontinental flight will be along the Lincoln Highway, with stops at Salt Lake City, Denver, Chicago, and St. Louis.

Anti-Aircraft School at League Island

According to plans now under discussion, League Island, Philadelphia, will be made the headquarters and training school of the Government's first anti-aircraft corps. In addition to the establishment of a school of aviation at the navy yard, it is proposed to instruct the marines and bluejackets in the use of high-angle rapid-fire guns, the only weapons with which an aerial attack can be combated with any degree of success from the ground. The men will be taught the method of operating small machine guns against aerial crafts, and also the use of larger guns in each kind of warfare.

Instructions in sighting will be given by training the guns on aircraft in actual flight. In this work the officers of the yard will have the co-operation of the trained aviators of the Aero Club of Pennsylvania. This organization has received permission from the Government for the establishment of an aviation school at League Island. Messrs. von Figyelmessy and Kays will be the instructors in charge.

Giant Curtiss Flying Boat Tested

The first of the Curtiss giant flying boats—known as the "Super-Americas" or model H-7—to be flown in the United States, received its first thorough testing at Newport News, April 24, in two flights, carrying eight persons.

The machine is modeled on the lines of the first "America," that was developed two years ago for the projected transatlantic flight.

The body of the "Super-America" is nearly 40 feet over all. Eight persons were quite comfortable in its cabin when it soared over the water at Newport News for half an hour. The spread of the upper wings is 80 feet and two 160-horsepower Curtiss motors furnish a speed up to 90 miles an hour. The craft was held out of a consignment for the British, and delivered to the Coast Guard with the personal compliments of the manufacturer, Glenn H. Curtiss.

A heavy wireless equipment is to be installed with the idea that the boat shall be used as a scout to locate derelicts and either blow them up or stand by, even on a rough sea, while the wireless summons a cutter.

Curtiss J. N.-5 Tested

The J N-5, a two-passenger twin motor biplane of a new type, especially adapted for military purposes, was tested at the Atlantic Coast Aeronautical Station, April 24, and was said by school officials to have met all requirements. United States Army aviation officers witnessed the test.

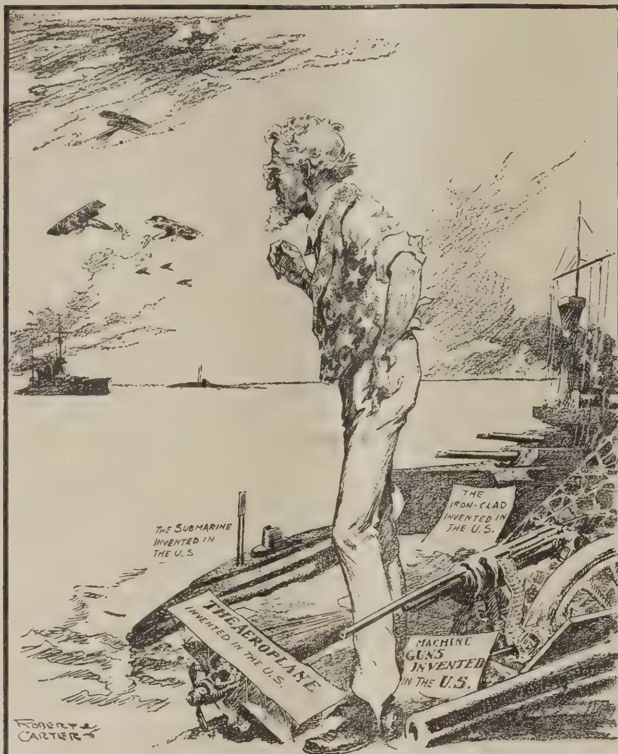
The machine makes a speed of 100 miles an hour and climbs 1,000 feet a minute.

Official tests of the military tractor, R-2 model, eight of which recently were bought by the War Department for use in Mexico, were completed and Army experts were pleased. The tests were made by Victor Carlstrom, carrying one passenger and 150 pounds load. The test showed: High speed, 92 miles an hour low speed, 41.3 miles an hour; climb, 5,000 feet in ten minutes; fuel capacity, four hours at high speed.

The Naval Appropriation Bill

A Naval Appropriation Bill carrying nearly $250,000,000 probably will be the contribution of the House Committee on Naval Affairs to the national defense program. The tentative bill prepared by the sub-committee is understood to provide an appropriation of $2,000,000 for aviation in the Navy, including experimental work and maintenance of aircraft stations, and $85,000 for the work of the Advisory Committee on Aeronautics.

The H-7 Model Curtiss Flying Boat which made a flight lasting half an hour at Newport News last week with eight people aboard.



"Those Fellows Have Stolen My Stuff!"

Courtesy Evening Sun

Thompson Bombards New York

On Wednesday evening of last week De Lloyd Thompson repeated the performance with which he startled the people at Washington the week prior over the lower section of New York City and Brooklyn. He started from Governors Island in a Gyro Motored Day tractor and went directly over the Whitehall Building, made three loops before proceeding to drop his "bombs." From each of the planes four bombs were hung on a makeshift wooden framework, and on each plane and below the cockpit a set of six flares were fastened. These were wired to a switchboard which Thompson could operate from his seat, exploding them at will. On account of the flight being pushed several days ahead of the schedule it was impossible to make the proper arrangements for the housing of the bombs, with the result that one of the bombs failed to be liberated and exploded while attached to the plane, which resulted in considerable damage to the lower plane of his machine.

Thompson plans to pay similar visits to other cities of the East in the near future, including Philadelphia and Boston.

Rubber Company Takes Up Question of Aerial Preparedness

The European war has demonstrated the increasing value and usefulness of rigid and non-rigid balloons both for military purposes and as a means of rapid transportation. Our own government has observed closely the achievements in this newly developed branch of aerial navigation, and investigations have been started with an end to equip our naval and military forces with proper airships.

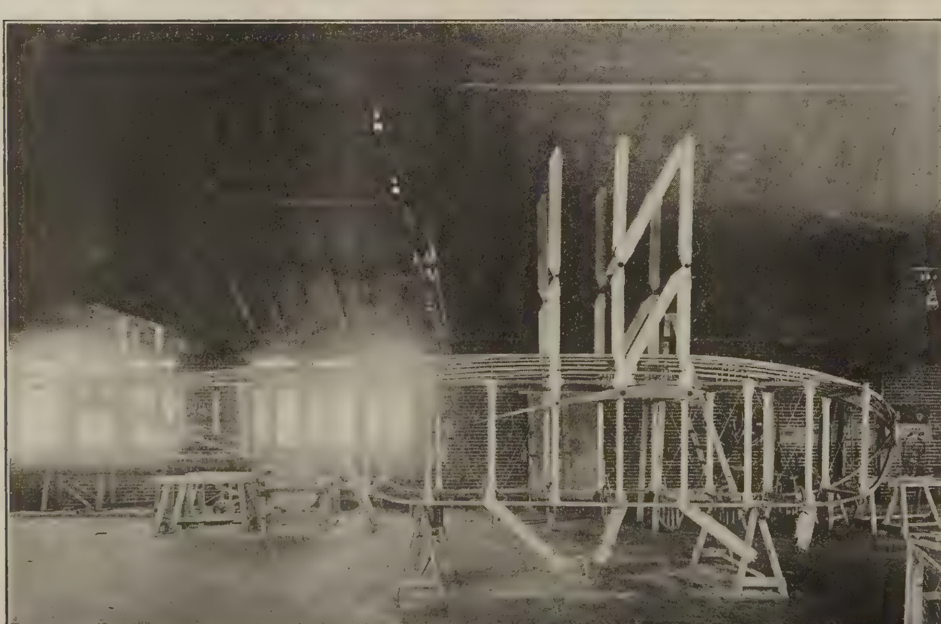
From the start it was found to be no easy matter to build a military balloon. The warring nations of Europe alone possessed sufficient technical information and experience to proceed with any degree of assurance and success. Although pioneers in the effort to conquer the air, the United States soon dropped far behind in the work of perfecting the movement they began and now is far outdistanced by more far-sighted competitors.

It has devolved upon our own manufacturers by means of experiments and such external resources as lay at their command, to rediscover those laws and rules that govern aerial navigation. When we consider the decades that have been consumed in bringing ballooning to its present incomplete state of development, the difficulty of putting it on a practical basis in the short space of a few years is readily apparent.

The United States Rubber Company was among the first to start in search of knowledge in this new enterprise. This company did what always has been done in such cases. First, it collected all the obtainable data as to what others knew of the subject, and, with this to work on, set about improving and correcting the mistakes of others. It took months of patient research, and many more months of costly experiment to attain financial success. In each case trained scientists were aided by the suggestions and advice of numerous experienced aeronauts, working with almost unlimited resources and sparing no expense.

The result is the balloon fabric now manufactured by the United States Rubber Company. The sheetings used are the lightest and strongest that can be produced in America. They are woven from the finest Sea Island cotton, with an even break in warp and filler and are free from knots, broken threads and such imperfections as are the bane of balloonists. The fine, pure rubber, a secret process of the company's own invention, is applied by specially trained workmen so as to produce a smooth, impermeable surface.

All this has been accomplished in an incredibly short space of time. What further advancements will be made we can only surmise. The possibilities in aerial navigation are so unlimited that no amount of effort and energy expended in its behalf can be considered wasted. The United States Rubber Company has entered the field of ballooning as a seeker after knowledge, and as such it will be found years after the art has passed its experimental stage. Each day one of their groups of persistent energetic thinkers is contending with the problem of adding to the world's output of high-grade fabrics.



Framework of the fuselage of the Trans-Continental triplane now under construction by the C-E Aeroplane Co., at Anderson, Indiana.

11,100 Feet with Two Passengers

Victor Carlstrom, instructor in the Curtiss Aviation School at Newport News, in a flight April 19 rose to an altitude of 11,100 feet, thus establishing a new American record for an aeroplane carrying three persons. The machine, a miliary biplane, was in the air for an hour and twenty-seven minutes.

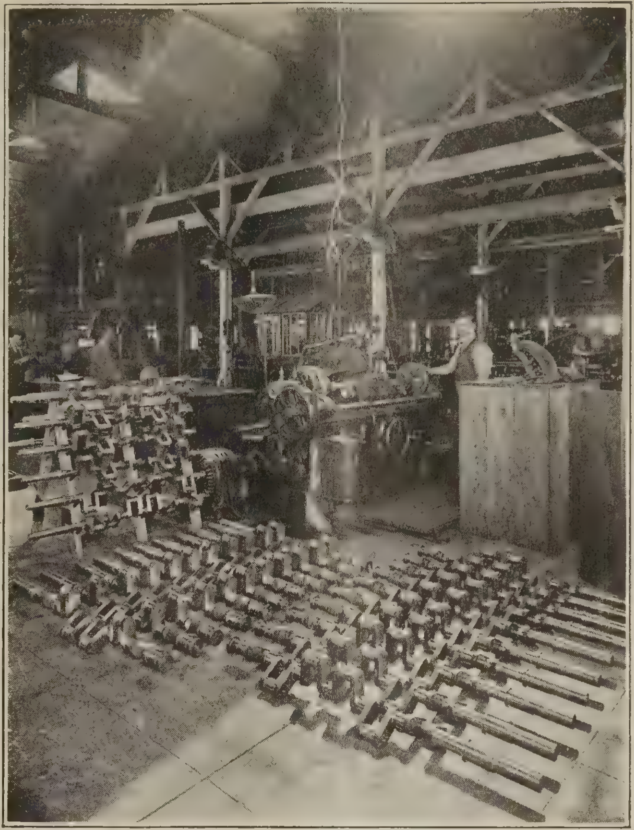
Aerial Preparedness Exhibit at the Grand Central Palace

Our readers will be very much interested in learning that the Third National Exposition of Safety, under the auspices of the American Museum of Safety, will be held at the New Grand Central Palace between May 22nd and 29th, and will comprise a very interesting exhibit presenting graphically the importance of aerial preparedness. Suspended from the ceiling in the center of the Palace will be the machine which Robert G. Fowler used when he flew across the Isthmus of Panama, and in this connection there will be shown various photographs which Fowler had been able to make, which show how absolutely necessary it is that we should have proper aerial protection for the great engineering works at the Isthmus. Various types of aeroplanes in model form will be shown, aviators' uniforms and equipment, rapid firing guns and anti-aircraft guns, compasses and other types of aeronautical instruments. There will be a complete exhibit of the Sperry Gyroscopic Stabilizer operated in a small model. There will be also an exhibit of aero engines, showing some of the types most in use in this country at the present time. Altogether the exhibit will be of very real interest to the intelligent citizen who wants to acquaint himself with this important branch of national defense.

National Special Aid Society Raises Fund

Mrs. C. Monteith Gilpin, of 399 Park avenue, is responsible for the latest move in preparedness, the starting of a fund to be known as the "American Women's Hat Fund of Greater New York," to which 1,000 women addressed by letter were asked to contribute the price of one spring hat, whether it be $5 or $25, more or less. Mrs. Gilpin, in her letter announcing the plan, says: "This money is not being raised for charity. It is for the defense and protection of the women and children of New York City; to provide a form of insurance against attack by an enemy just as we insure our houses against fire or thieves. No one expects such an attack any more than one expects a fire or a burglary, but it is quite as necessary to provide against one as the other."

Checks are to be made payable to the National Aeroplane Fund of the Aero Club of America and sent to Charles Elliot Warren, care of Lincoln National Bank. All contributions will be acknowledged by the Aero Club of America. The National Special Aid Society, of which Mrs. William Alexander is the President and Mrs. T. J. Oakley Rhinelander is Vice-President, indorses Mrs. Gilpin's appeal.



The crankshaft grinding machine with a number of A-5 engine crankshafts at the Hall-Scott factory.

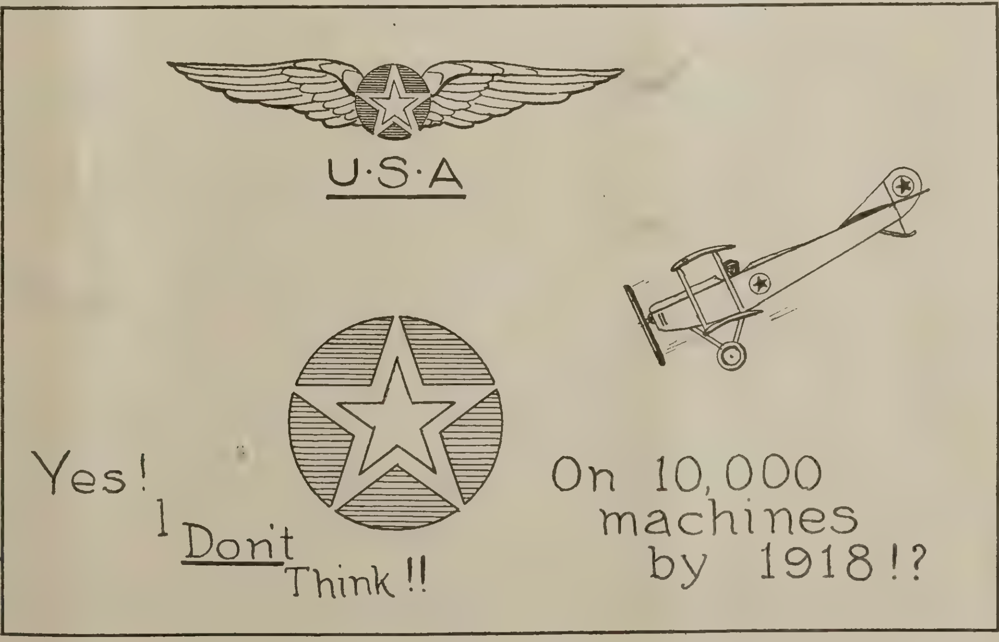
Export of Aeroplanes

During the week beginning Monday, April 17, the following exports were made in aeroplanes and parts: To Great Britain, $184,219; to Mexico, $23; to France, $60; total, $184,302.

New Biplanes at Columbus

A dispatch from Columbus says that several members of the army aero corps have prepared for service two of the new biplanes ordered for expeditionary purposes. It was said the biplanes would be assembled and ready for trials on April 22.

A prophetic sketch sent in on the back of an envelope by Flight Sub-Lieut. W. H. Peberdy now with the R. N. A. S. Here's to its consummation!



PERSHING WITHOUT AEROPLANES

SIX of the eight aeroplanes which have been used by the punitive expedition in Mexico have been destroyed as worthless junk. The other two machines are undergoing repairs at Columbus. The engines of the first six are to be brought back on motor trucks. Their pilots are now making a jolly return to Columbus by the same slow means of transportation. In other words, the Mexican campaign has already proved just about the last chapter in the history of the "first squadron of the aviation section of the United States Army Signal Corps."

Shortly after the aeroplanes first went into Mexico, when only two or three of them had been destroyed by a comparatively small amount of service, the aviators of the section deviated from their custom of maintaining silence and told correspondents what was the matter with their machines. The machines were inferior in numerous details. Their engines were too weak to carry a man above rifle range when flying over high altitudes, such as the Mexican service required. They were of a type that had long since been condemned for army service in Europe. Even General Pershing let it be known that he intended to demand no more service of the aviators than was absolutely necessary, because they were "taking their lives in their hands" with every flight.

Previous efforts to procure up-to-date aeroplanes for the squadron had been unavailing, but when the actual conditions became generaly known to the public Congress made an emergency appropriation for eight new ones. Six of these have just arrived at Columbus and are now being set up. These are Curtiss tractors. The two others, of the Sturtevant armored type, are on their way and will be placed in service in Mexico if the campaign is renewed.

But the aviators have been muzzled again. It is reported some are to be "reprimanded" for talking. One of their complaints is that in the American Army aviation is considered secondary to the extent that the squadrons are merely parts of the Signal Corps and do not constitute an army unit of their own, as in European armies. The army aviators now returning to Columbus just shake their heads now and smile resignedly when asked to talk of army aviation conditions, and word has gone down the line even among the swarm of mechanicians that not one of them must be caught talking to a newsaper man—or woman, for one of these has arrived in Columbus.

CALIFORNIA MILITIA AVIATION SECTION ACTIVE

AS is evident by the accompanying illustrations the aviation section of the California Militia has been showing very real activity during the past few months. The section has two trained pilots, members of the Militia, training the students in Hall-Scott motored Martin machines. All of the members are thoroughly awake to the possibilities of the service and are going to their work with zest and enthusiasm which is highly commendable. The California section is very fortunate in having the assistance of the Automobile Training Reserve, which offers excellent transportation and various other types of co-operation. On every occasion when the aviation section is having practice there is a detachment on the field from the hospital corps ready, if occasion should arise, to immediately offer first aid.

Mr. Frank Simpson, Jr., who is the California representative of the Aero Club of America, is in charge of the aviation section, and he is to be complimented upon the efficient manner in which he is handling his men.

Residents of Los Angeles are very proud of their aviation section and are showing very real progress in their advancement.

Motor transport corps co-operating with aviation section.

The aviation section having their setting up drill.

THE PACKARD TWIN-SIX

BY J. G. VINCENT

Vice-President of Engineering, Packard Motor Car Company

EACH year brings a new crop of rumors which seek to connect Packard with speedway contests. Such reports have met with a prompt denial, because the Packard Company has not even considered going into contests as a sport or spectacle.

The development of our new type Twin-Six engine, with its peculiar fitness for sustained speed, has furnished substantial reasons for demonstrations under racing conditions. That is why many recent rumors have been based on circumstances which gave them an appearance of truth. Packard engineers have been engaged repeatedly in speed trials on the speedways at Indianapolis, Chicago and Sheepshead Bay.

We are maintaining our own experimental garages at these tracks, and we believe the speedways have rendered a distinct service to the art in providing facilities for such research work. Nowhere except on a speedway is it possible to subject a car to the rigorous test of continuous running at a speed of approximately 100 miles an hour.

I wish to emphasize, however, that the purpose of these tests is to collect information relating directly to the design of our standard product. In fact, these efforts to establish principles of design permitting sustained high speed without sacrificing smoothness were directly responsible for the development of the Twin-Six engine.

It was merely a coincidence that we perfected our Twin-Six engine at about or shortly before the time that this type of motor was becoming recognized abroad as the most efficient power plant for aircraft. It is well known that our engine is the product of original research and invention. We can establish the fact that our factory was all tooled up for the manufacture of this model at the time we purchased the original Sunbeam Twelve. This car was torn down and thoroughly examined in our experimental shops, but the examination served only to reassure us as to the worth of our own design.

Recently, we became informed of the remarkable strides being made by the European powers in developing Twin-Six engines for aircraft. Realizing that the United States might be placed at a great disadvantage, by not keeping abreast of the world's progress in this important branch of the art, we decided to develop aircraft motors, in addition to our established product.

We have designed two separate and distinct Twin-Six motors for aircraft, one of maximum capacity for load carriers, and a much smaller engine for scout work and private use. As it happens, this smaller engine has a total piston displacement of about 300 cubic inches. For convenience in proving out its durability, I am placing some of these motors in racing type chassis, with the intention of driving them at high speed for long periods of time.

This method of testing aircraft motors is the same as that used by the Mercedes Company a few years ago, when they constructed several racing cars around their experimental aircraft motors and captured the Grand Prix, which was so courteously staged by the French. The consistent performance of these engines during the present war has proved how thoroughly this engineering work was done.

We shall make a very thorough comparison between the performance of this aircraft Twin-Six engine and that of all available types of high efficiency motors which have been developed especially for speedway or aircraft work. Incidentally, we expect to secure some valuable data on the comparative efficiency of fours, sixes, eights and twelves of equal piston displacement. We shall get this information as part of our regular engineering work, in pursuance of which we shall continue to carry on private tests on speedways.

We have every reason to believe that our small-bore twelve-cylinder aircraft engine will develop more power and will run longer at high speed than any other type of equal piston displacement. When the various points of superiority have been firmly established, the way will be open to many interesting developments.

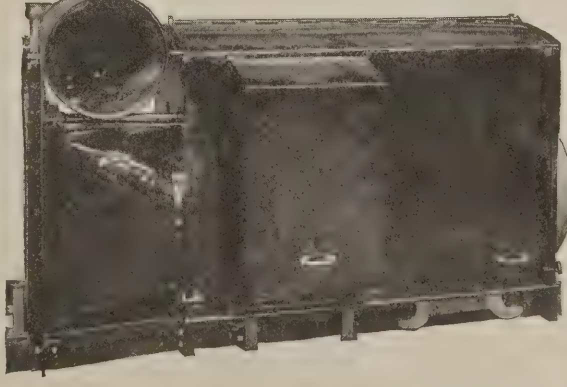
Our attitude is unchanged. We have no prejudice against racing and we have no intention of taking part in speedway contests. But in view of the great public interest in the performance of our aircraft motors, it is entirely possible that exhibition speedwork will be carried on this season under A. A. A. supervision.

HELPING THE ARMY

THE accompanying illustration shows a new adaptation of the Sturtevant gasoline generating set. These sets have been sold to the United States Government for use in aeronautical training camps, hangars, shops, etc., and for field searchlights. Several of these outfits have been ordered by the United States Government, and one of them is in very successful operation at the United States Signal Corps Aviation School at San Diego, California. The sets are intended to be used in direct connections with lighting and power circuits and not through storage batteries, although they may be so arranged if desired. A very sensitive governor control, together with other fineness in design of engine and generator, insure a constant voltage through wide variations of load.

When the idea of the sets was first conceived, it was realized that there was a demand for an electric generating set that was easy and inexpensive to operate; that would not require the services of an experienced engineer in constant attendance; and that it could be easily and readily transported from place to place. The unit consists of a Sturtevant portable electric generating set, made up of a Sturtevant direct-current electric generator, directly connected to a Sturtevant gasoline engine. A switchboard and gasoline tank are also included. A special type of disc fan is mounted on an extension of the generator shaft and arranged to blow air through a cellular type radiator. All of this apparatus is mounted upon two channel irons, and the engine generator and switchboard are covered by a sheet metal housing, similar to an automobile hood. The engine is of the four-cylinder, water cooled, vertical type, with either four or six cylinders, according to the size of the unit.

Three sizes of these sets are built—5-kw., 10-kw., and 15-kw. capacity, capable of lighting 200, 400 and 600 20-candle power tungsten lamps. Both engine and generator are capable of operating under an overload of 25 per cent for two hours.



THE BRITISH-BUILT TWIN-ENGINED CAUDRON BIPLANE

AFTER the success attained by the original twin-engined Caudron biplanes, it is not surprising that the British Caudron Co. turned their attention to the production of similar machines, and judging from the air-work that the first of the British-built biplanes has already done during the comparatively short period since it was first tested, there seems to be every reason to expect that it will worthily uphold the reputation established by its French prototypes.

We are indebted to our London contemporary, *Flight* for the following facts and accompanying illustrations. During the preliminary trials carried out recently the carrying capacity, speed and climb were all demonstrated to be very good, and the acquisition of a number of machines of this type by the British Air Services will be a valuable addition to their equipment.

Each of the Anzani engines is mounted in a little *nacelle,* which serves the double purpose of supporting the engine and its tanks, enclosing the latter in a streamline casing. The method of supporting each engine on one-half of the chassis by "Vee" struts is one of the many good points of this machine, forming, as it does, a structure of great strength.

Pilot and observer are comfortably installed in the central *nacelle,* both obtaining a very good view forward as well as downward on account of their respective positions.

Apart from the questions of engines there is no radical departure from ordinary Caudron practice. The main planes are characterized by the same flexible trailing edge which has always been one of the outstanding features of Caudron machines, and one to which, no doubt, they owe a large proportion of their good stability. As in earlier models, the upper plane is of considerably greater span than the lower, the overhang being braced by struts running out diagonally from the outer inter-plane struts. One departure from standard Caudron practice will be noticed in the reduction of the amount of trailing edge of the lower plane.

From the accompanying illustrations it will be seen that the usual flexible elevator has been discarded and in its stead one of the hinged, divided type fitted. The tail plane, the angle of incidence of which is adjustable, is surmounted by four small triangular fins to which are hinged the four rudders. This large rudder area has, of course, been necessitated by the extra amount of vertical side area presented by the three *nacelles,* and also partly by the fact that the two inner rudders do not receive any of the "slip" from the propellers. When flying with only one engine running a large rudder area is also essential in order to counteract the turning couple. Owing to the long skids, which act as very efficient brakes when landing, the twin-engine Caudron pulls up comparatively quickly, an advantage not otherwise easily obtained, as will be readily understood when it is considered that the momentum of such a great mass as that presented by two big engines, pilot and observer, and the weight of the machine itself, is of very considerable magnitude.

Constructionally the Caudron is exceedingly well made. Some of the fittings, we understand, are particularly ingeniously well made, but the censor makes it impossible for us to get the detailed facts concerning them.

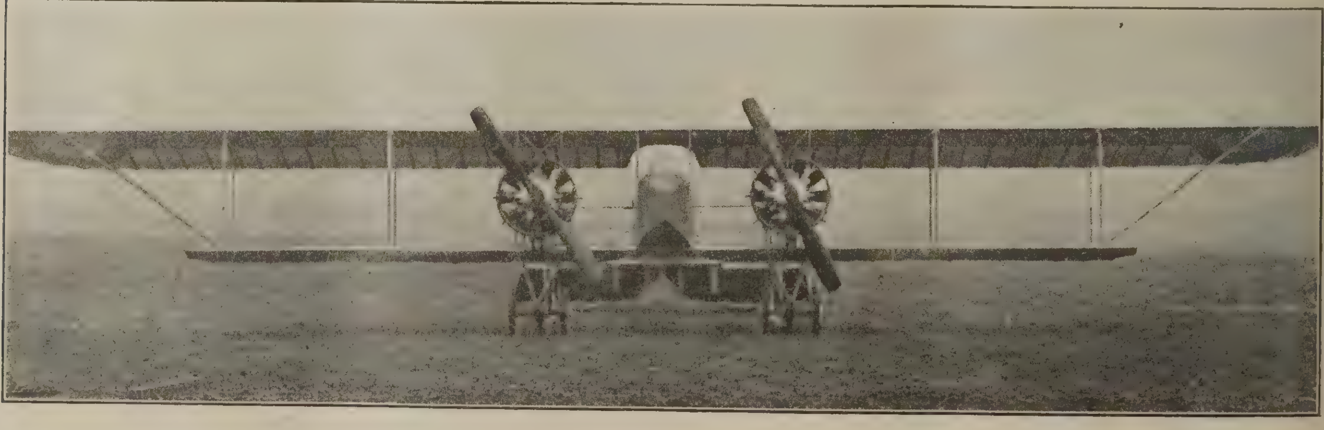
A New Fuel?

A chemist by the name of Enricht believes he has invented a formula, the ingredients of which, combined with water, will produce a fuel for use in internal combustion engines, as efficient as gasoline, and at a cost of about two cents a gallon. Thus far he has been very secretive about his invention, giving only the information that the formula is compounded in powder form. He claims (supported by one witness) that all he has to do is to fill his engine tank with water, put a few ounces of the powder in, and the machine will run as efficiently as if gasoline were used. He says that he uses neither sodium or potassium to produce the explosive mixture of hydrogen and oxygen.

Impressed by representations made to him by his agents here, Henry Ford, on April 22, came from Dearborn, Mich., to see Mr. Enricht. While the inventor had not enough of the fuel on hand to give Mr. Ford a demonstration, the automobile manufacturer was so impressed by the sincerity and personality of the man that he presented him with a new car.

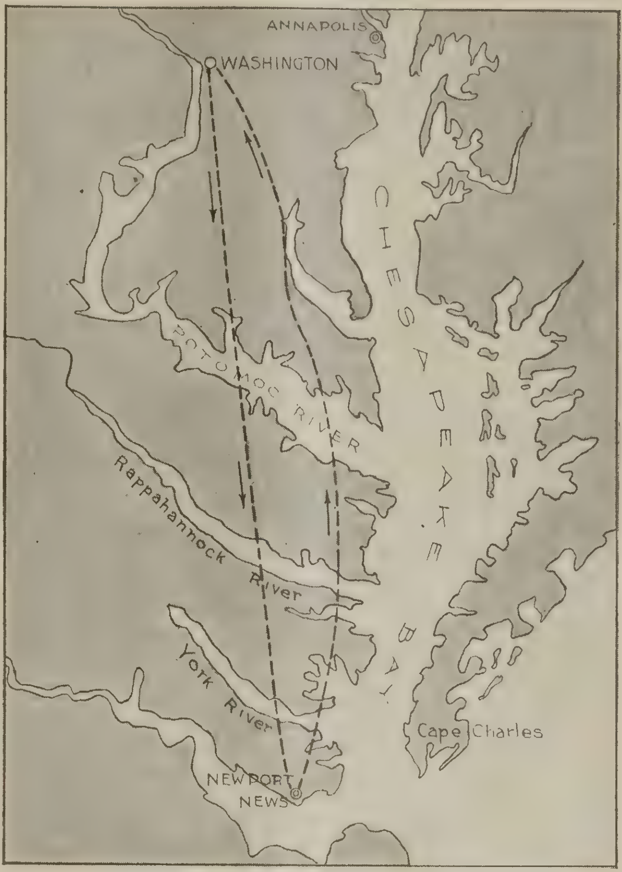
Mr. Enricht asserts that he has received numerous offers of financial backing if he wishes to form a company for the exploitation of the product. However, Mr. Enricht states that after he has received enough funds to recompense him for his expenses in carrying on his experiments, leaving him a moderate balance, he would rather have the world at large profit by the result of his labors.

Mr. Ford, when interviewed last night, issued the following statement: "While I did not see a demonstration of the new liquid on account of Mr. Enricht's being out of certain chemicals, I am greatly interested in the man himself. I was much impressed by his sincerity. We will have a demonstration in Long Island in the near future."



STEVE MAC GORDON'S RAID ON THE CAPITOL

WE have pleasure in presenting to our readers this week a map of the course followed by Steve Mac Gordon on his recent raid on the Capitol On the trip from Newport News to Washington the weather was rather hazy and as is shown by the dotted curve line the pilot closely followed the line of the Chesapeake Bay to eliminate all possibility of losing his bearings. But the return trip, however, was of a much more direct route, as is shown by the map. Speaking of his trip Mac Gordon said, "the available landing ground was not as good on the return trip and as a matter of fact there were very few places either going up or returning suitable for landing, as the contour of the country is rather rough and there are clumps of pine forests scattered all over. I flew at an average height of 8,000 feet, except when over Washington, where I descended to about 2,000 feet, circling around the city twice. On my return a strong gusty wind delayed me about forty-five minutes, in spite of the more direct course followed. My motor ran beautifully and never caused a bit of trouble. I believe if there is any place that needs protection it is Washington, as the country I flew over is very sparsely populated, with no railroads, and nobody saw me over the city until I descended to an altitude of two thousand feet. It would have been very easy for me, had I been an enemy aviator, to have dropped bombs and to have returned to my fleet or base without danger."



The following are the time of departure and arrival of Mr. Mac Gordon's trip:

Left Newport News for Washington at 3,000 feet at 10.20 A. M.

11:40—Crossed Potomac River.

12:15—Washington sighted.

12:33—Over city 8,000 feet high.

12:40—Left city approximately 2,000 feet high.

1:42—Crossing Potomac.

3:19—Over Newport News, approximately 10,000 feet.

3:25—Landed.

Total time—5 hours and 5 minutes.

Burgess News

Work at the school of the Burgess Company at Marblehead, Mass., is developing at a rapid rate. Two school machines in addition to two types of naval aeroplanes are in constant use, with five pupils now actively engaged.

Trials of a new navy war seaplane, equipped with a Curtiss motor of 160 horsepower have shown this craft to be very fast. Unofficially the speed made by this machine when driven in its tests last week by Aviator Clifford L. Webster, showed nearly 90 miles an hour.

The aeroplane built for Godfrey Cabot, of Boston, has been completed and is flying daily, Mr. Cabot having nearly completed his course of instruction as a pilot. This machine, together with that constructed for Norman Cabot and George R. Fearing, is to be used during the coming summer in connection with the training of an aviation section in the Massachusetts Naval Militia.

In addition to the craft built by the Burgess Company for Massachusetts people, two new machines of the Dunne type are now under construction for Howard S. Borden, of New York, and for the Naval Militia of New York State. These machines will be ready toward the latter part of May, and instruction will be furnished at Marblehead by the Burgess Company for the aviators.

Steinmetz Lectures in Philadelphia

Mr. Joseph A. Steinmetz, President of the Aero Club of Pennsylvania, lectured before the Philadelphia Manufacturers' Club on the evening of April 11. He stated that although the United States was the birthplace of the aeroplane and hydroaeroplane, our Army and Navy were far behind in aerial equipment. We have, he declared, no organized service to meet an emergency. "A huge aerial fleet would make the United States almost impregnable." He said: "The enemy could not make a move unless we were aware of it. The Panama Canal, Hawaii and the Philippines are not sufficiently equipped with aircraft. At least thirty or forty aeroplanes should be available on these stations. We should have 5,000 aeroplanes."

Ruth Law and Her Flying

Reports from Bath, N. Y., have it that the aviatrix, Ruth Law, is doing such wonderful flying that the employees of the Curtiss factories in Hammondsport feel compelled to stop their work and gaze upward in open-mouthed wonder. Last week she gave an exhibition of aerial acrobatics that surpassed anything seen there before. She arose over the village and commenced loops and somersaults in quick succession. It is stated that at first the villagers were fearful for her safety, but impressed by her mastery of the plane, stayed to watch in admiration.

Portuguese Officers Go to France

The four Portuguese army aviators, who were sent to this country to learn aviation at the United States training school on North Island, have received orders from their government to proceed to France to complete their course. They are Captain Cifka Duarte, Lieutenant Francisco Aragao, and Sub-Lieutenants Carlos Beja and Salguerio Valente. After the declaration of war between Germany and Portugal, the United States War Department informed the four officers that because of the neutrality laws permission for their instruction at a government aerodrome in this country would have to be revoked.

Aeroplanes for N. Y. N. G.

The first of the four new aeroplanes ordered for the first aviation detachment of the New York National Guard has reached the Mineola aerodrome, and will be tested this week. The machine is the same kind as those recently ordered by the Government for service in Mexico, the Curtiss J. N. 160 h.p. military tractor. The other machines will be a 125 h.p. Hall-Scott motored Sloane tractor, a 135 h.p. Thomas tractor, and a 140-h.p. Sturtevant battleplane.

The aeroplanes were acquired by the State through the National Aeroplane Fund of the Aero Club of America. Forty-five men have enlisted in this detachment and have been taking flying lessons and studying military aeronautics all winter. Efforts are being made to procure four more aeroplanes. The detachment is commanded by Lieut. Raynal C. Bolling.

THE ORLO AERONAUTICAL MOTOR—MODEL 0-8

THE Orlo Motor Company, of Rochester, New York, have just received an order from the Navy Department for one of their eight-cylinder aeronautical motors, of which we are enabled to give the following description:

CYLINDERS: The cylinders are of special gray cast iron. The cylinders are cast separate and are machined up both inside and outside, which is a very important feature, in order to insure perfect cooling and prevent ignition. The cylinder heads are machined on the inside to insure equal compression.

The cylinders and pistons are thoroughly annealed and heat-treated, after being rough machined, to relieve all strains.

The water and gas manifolds are so designed that any one cylinder can be removed without disturbing the rest of the motor.

The cylinder water jackets are of spun brass, zinc-plated, with a very liberal allowance in water space between jacket and cylinder.

PISTONS: The pistons are of gray iron with phosphor bronze bearings for the wrist pin, which is held fixed in the upper end of the connecting rod. The two rings in each piston are of the sectional leak-proof type.

CONNECTING RODS: The connecting rods are of chrome-nickel steel, tubular section, and are 12 5/16 inches long. The cylinders are set directly opposite each other so that one rod bears directly on the crank pin, while the other oscillates on it, thus giving the full crank pin bearing for each rod and making the motor short and compact.

CRANKSHAFT: The crankshaft is hand-forged from chrome-nickel steel, machined and ground to size, and accurately balanced. It is supported on five babbitt bearings and also a large ball bearing at the rear end of the crank case.

The propeller flange is forged integral with the shaft, with hardened bushings inserted half in it and half in the flange on the propeller; thus taking all the shear off the propeller bolts, and making a coupling that is as strong as the shaft itself.

VALVES: The valves are dropped forged from nickel steel, and are placed directly in the cylinder heads, no valve cages being used, which allows of simplicity of design, without leaks due to unequal expansion. Separate rocker arms and push-rods are employed for intake and exhaust valves, so that accurate timing can be easily secured.

The valve-lifts, or tappets, hardened and ground, have radial-shaped bottoms, instead of the old-style mushroom shape, thus giving an easy lift without the slap of the old style.

Valve tappet guides are aluminum bushed with phosphor bronze.

The push-rods are hollow steel, zinc-plated, and have a ball and socket joint at the top end, as well as the bottom, which does away with the old-style shackles and pins on the rockers.

OILING SYSTEM: Oil is carried in the lower half of the crank case, which contains 3½ gallons, and is pumped from there to the camshaft, where it goes to each of the main bearings. From there it enters the crankshaft and is forced to each of the crankpins under pressure. The camshaft also has four nozzles so placed that they squirt a stream of oil on each rod as it passes through one-half the stroke, and also on the cylinder walls and wrist pin.

CRANKCASE: The crankcase is of aluminum alloy, thoroughly webbed, and containing five main shaft bearings, and one large ball bearing. The cylinders are not fastened to the crankcase as is the common practice in gasoline motors, but are tied to the crankshaft itself, by virtue of steel studs that extend clear through the aluminum crankcase to the main bearings, which are manganese bronze, lined with babbitt. This makes it impossible to blow off a cylinder and takes all strain off the crankcase, except that due to the torque of the propeller.

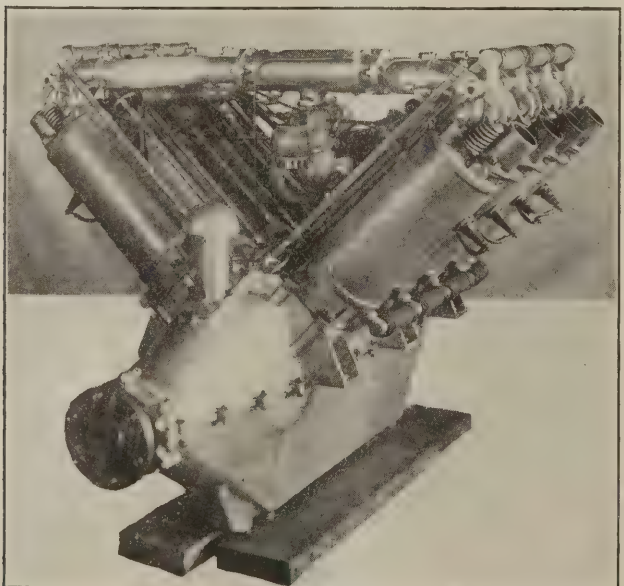
The crankcase is extended at the rear to allow greater movement in shifting the motor forward or backward in balancing up the machine. The propeller thrust is cast integral with the rear end of the case, and arranged with ball race to take thrust in either direction.

CAMSHAFT: The camshaft is hollow and has five phosphor bronze bearings. The cams are keyed on the shaft.

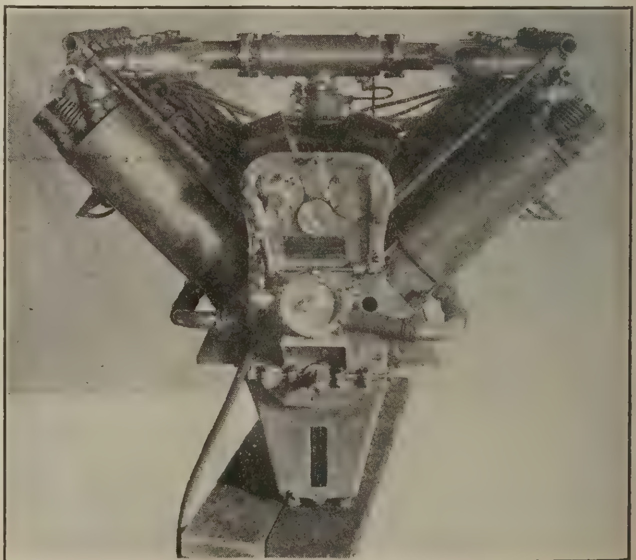
IGNITION SYSTEM: The regular equipment on these motors includes two Dixie-80 magnetos, firing two sets of spark plugs simultaneously, placed in opposite sides of the cylinders. Either magneto is capable of giving 90 per cent. of full power.

COMPRESSION, RELEASE, ETC.: This motor is equipped with a device for raising all the exhaust valves simultaneously, thereby making it easy to start. It is also equipped with Tachometer, showing the number of revolutions of the propeller at all times, and with an oil pressure gauge, which can be mounted on an instrument board in plain sight of the operator.

WEIGHT AND HORSEPOWER: This motor weighs 475 pounds, complete with magnetos and carburetor, but without radiator and propeller, and delivers 125 horsepower at 1,400 r.p.m. The liberal size valves and straight cylinders allow of a much higher speed, however, if desired, with a correspondingly greater horsepower.



Three-quarter view Orlo motor.

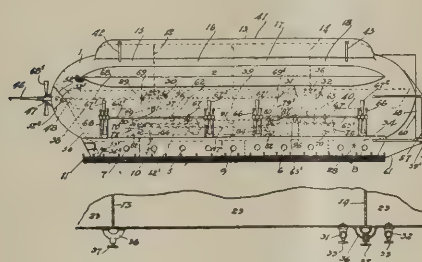


End view Orlo Model 0-8.

RECENT AERO PATENTS

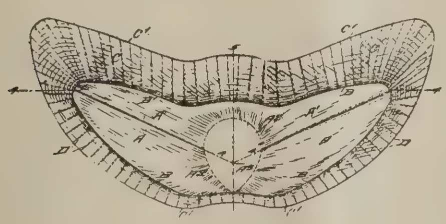
BY WILLIAM N. MOORE

1,134,241. DIRIGIBLE AIRSHIP. Joseph Spiteri, Winnipeg, Manitoba, Canada. Filed Aug. 31, 1914. Serial No. 859,302. (Cl. 244—3.)



1. In a dirigible airship a cylindrical gas containing body sub-divided by cross partitions into distinct sections and having the sections individually sub-divided by a plurality of partitions into a plurality of compartments, means for separately inflating the sections and valve controlled means connecting the adjacent compartments of the respective sections, as and for the purpose specified.

1,149,827. AUTOMATIC SELF-STABILIZING PLANE FOR AEROPLANES, Rutherfurd Scott Hartz, Vancouver, Wash. Filed Feb. 27, 1915. Serial No. 10,954. (Cl. 244—12.)



1. In an aeroplane, a sustaining plane comprising a rigid inflectionless member elongated transversely from a central body portion to constitute wings, and a flexible flange extending across the rear of the said body portion and wings around the ends of the wings and portion of its front edge.

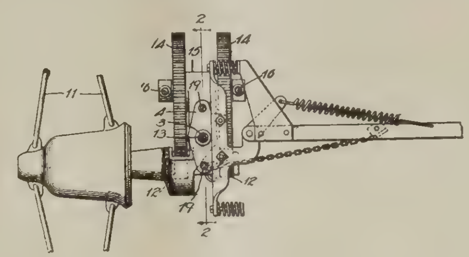
2. In an aeroplane, a sustaining plane comprising a rigid body portion having the general contour of a bird with outstretched wings, and a flexible flange projecting from the perimeter thereof and inclosing the same.

3. In an aeroplane, a sustaining plane comprising a rigid main or body portion and laterally extending wing portions, and a flexible flange surrounding the perimeter thereof, said flange increasing in width from the front center to the tops of said wing portions.

4. In an aeroplane, a sustaining plane comprising an inflectionless laterally elongated body member and a surrounding flexible flange member, the upper and lower surfaces of said body and flange members curving upwardly in all directions from a common center.

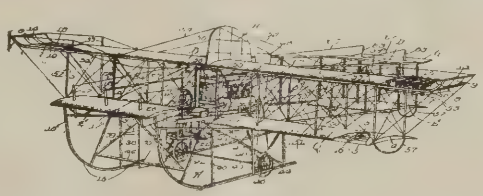
5. In an aeroplane, a sustaining plane comprising a rigid inflectionless member elongated transversely from a central portion to constitute wings, the front edge of said member curving rearwardly, and the rear edge thereof curving inwardly to the central portion and a self-flexing flange surrounding said rigid member, the upper and lower surfaces of the rigid member and the flange member curving upwardly from the center of gravity of the body portion, as a common center.

1,143,324. POWER-TRANSMISSION MECHANISM. Daniel R. Scholes, Chicago, Ill., assignor to Aermotor Company, Chicago, Ill., a Corporation of Illinois. Original application filed Apr. 9, 1914, Serial No. 830,580. Dividend and this application filed Oct. 7, 1914. Serial No. 865,484. (Cl. 74—14)



1. Power transmission mechanism including a motor driven shaft; a reciprocating upright load rod; a pair of gears driven by the motor driven shaft; a second pair of gears which drive the load rod and which are driven by and are in mesh with the first; and pitmen that establish power transmitting connection between the gears of the second pair and the load rod, the gears of the second pair having shaft, one of which enters the other and which shafts are in relatively rotatable relation.

1,154,214. FLYING-MACHINE. William E. Somerville, Coal City, Ill. Filed Nov. 4, 1910. Serial No. 590,621. (Cl. 244—12.)



1. A flying machine comprising a motor, an upper main plane, a lower main plane, a pair of rear planes, a movable front plane, the outer ends of the upper plane being curved upwardly, a fin extending upwardly from the center of said upper main plane, a movable rear plane, and means whereby said movable planes may be moved in unison in opposite directions.

2. A flying machine comprising a motor, an upper main plane, a lower main plane, a pair of rear planes, a movable front plane, the outer ends of the upper plane being curved upwardly, a central fin extending longitudinally of said machine and projecting upwardly from the central portion of said upper main plane, a movable rear plane, and means whereby said movable planes may be moved in unison in opposite directions.

3. A flying machine comprising a motor, an upper main plane, a lower main plane, a pair of rear planes, a movable front plane, the outer ends of the upper plane being curved upwardly, a fin extending upwardly from the center of said upper main plane, a movable rear plane, means whereby said movable planes may be moved in unison in opposite directions, and hand operated means whereby the effective wind area of said upper plane may be varied.

4. A flying machine comprising a motor, an upper main plane, a lower main plane, a pair of rear planes, a movable front plane, the outer ends of the upper plane being curved upwardly, a central fin extending longitudinally of said machine and projecting upwardly from the central portion of said upper main plane, a movable rear plane, means whereby said movable planes may be moved in unison in opposite directions, and hand operated means whereby the effectiv wind aera of said upper plane mav be varied.

THE DEVELOPMENT OF ENGINES SUITABLE FOR AERONAUTIC SERVICE

Origin—Means Used, and Results

By CHARLES E. LUCKE

Service Requirements for Aeronautic Engines — Power Versus Weight, Reliability and Adaptability Factors

TRANSPORTATION over land and water has been revolutionized by the addition of engine motive power to vehicles and boats to a degree that requires no study to appreciate, but the contribution of the portable power plant to aerial navigation is even greater It is fundamentally creative, for without the aeronautic engine air flight would be quite impossible. Not only does an engine constitute the essential element of the aircraft, but the engine must be suitable for the purpose; it must have certain characteristics never before required or produced by engine designers. Success in flight and improvements in flying machines rests absolutely upon the success with which the engine and its accessories that make up the portable power plant can be made to fulfill the new requirements peculiar to the flying machine. Before some one flew, no one could specify just what the aeronautic motor should be able to do, except that, of course, it should be as light as possible and not stop in the air. Nor was there any demand for such an engine that would serve as an inducement to engineers familiar with engine production to build one. In short, while those few experimenters who were engaged in trials of balloons and gliding planes felt they might be helped if they could secure a proper light motor, no one felt sure it would be of service if produced, and of course no one could say how light it should be, or what other characteristics should be incorporated, except that of reliable continuous running during a flight. Formulation of some of these specifications may be said to date from about the years 1901-2, when the Wrights, on the one hand, and Langley, on the other, found that existing engines developed for other classes of service were unsuitable, the nearest approach being the automobile engine, then pretty uncertain in operation and weighing about 15 pounds per horsepower in the lightest forms—a weight that would not serve even if the operator were willing to risk his life on the possibility of engine stoppage in flight. It was apparent at once that redesign for reduced weight per horsepower was necessary, and the Wrights proceeded to rebuild the automobile engine, while Manly boldly departed from any existing practice and built his five fixed radial cylinder engine, both Manly and Wrights retaining the water cooling of the most successful automobile engines. Both succeeded in reducing weight enough to make flight possible, the Wright engine producing a horsepower with about 7 pounds and the Manly with about 2.4 pounds of engine weight, the former with a 12-horsepower, and the latter with a 50-horsepower engine.

Thus was flight initiated with engine redesign for weight reduction, and so has flight improved in range, speed, and safety, with further redesign of engine in the 13 or 14 years of time that have elapsed since that time, but the end is not yet in sight. The progress that has been made in engine construction, principally in Europe, is truly amazing, in view of the unique character of the problem and the short time that has elapsed; but all this has only served to increase the demand of the aeronautic engineer on the engine designer and manufacturer, so clearly and firmly is the principle established, that progress in flying rests fundamentally on engine improvement. These years of experience, however, have resulted in some data, drived largely from laboratory tests on the characteristics of the engines that are most successful in flight, and in some more or less accepted formulations of the sort of service required of aero engines and their essential parts in addition to weight, speeds, power, and general reliability, that might be classified as adaptability factors.

Any engine, for whatever service, must be suitable, and its design must be based as much on the specifications for suitability involving these adaptability factors, as on the fundamental principles of thermodynamics, stress resistance and the properties of the materials available, and these adaptability factors must be derived from the users or operators of the machines before the engine designer car interpret them, preparatory to the incorporation into the engine proper of those structural elements that will make it suitable. At the present time there are available some conclusions along this line of experience, a few of which will be quoted and summarized before undertaking to analyze the engine structure proper.

After nine years' use of engine-driven aeroplanes the engine structure was summed up in 1912 by Capt. H. B. Wild, Paris, as from his own experience as follows:

The comparatively crude and unreliable motor that we have at our disposal at the present time is, no doubt, the cause of many of the fatalities and accidents befalling the aeroplane. If one will look over the accessories attached to the aero engine of today, it will be noted that it is stripped clean of everything possible which would add head resistance or weight. The designer of the aero engine is too anxious to eliminate what he deems unnecessary parts in order to reduce the weight of the engine, and in doing so he often takes away the parts which help to strengthen the durability and reliability of the motor.

Few engine designers seem to appreciate the importance of eliminating the least tendency toward variation of angular velocity or in the torque, if the engine is required to drive a propeller. The effect of continually accelerating and retarding a propeller is most detrimental to its efficiency. * * * In front elevation an aero engine should be as compact as possible, so as to reduce head resistance.

Additional specific requirements named include—

(*a*) oil tank of six hours' capacity with reliable pump for forced feed lubrication, internal oil pipes, (*b*) standardized propeller hub and crank shaft end, (*c*) heater for carburetors and gravity feed of gasoline, (*d*) dual ignition and no loose wires, (*e*) exhaust silencer, (*f*) exhaust valve lifters for stopping and compression release for starting, (*g*) engine speed indicator, (*h*) cool valve seats. * * * Engine builders generally would also do well to visit aviation grounds more frequently and to take more interest in the engines which have left their hands, * * * though in many cases the aviator does not leave the engine alone when it is working right, but tinkers with the different adjustments until they are out of harmony with one another and places the blame where it does not belong. * * * The demand for a reliable motor is still prominent.

Writing in 1912, Awsbert Vorreiter, Berlin, gives the principal requirements which aviation engines have to meet, as—

First. Small weight referred to horsepower.

Second. Small consumption of fuel, water and oil, so as to obtain the maximum possible radius of action with a given quantity.

Third. Absolute reliability since in the case of the dirigible engine hardly any—in the aeroplane engine absolutely no—repairs can be made during a flight.

In the demand for low weight per horsepower the requirement of the low fuel and oil consumption per horsepower-hour are included, since today it is no longer a question of getting a machine to fly for a short time only, but to construct flying machines for practical purposes, we have to figure on a running time of several hours. It may easily be shown by calculation that an engine very light compared with output, but requiring an excessive amount of fuel, may weigh more per horsepower when the weight of fuel and oil are included than a heavy engine with low fuel and oil consumption. It is true that the oil consumption cuts less of a figure because the quanitiy of oil as compared with the fuel is small, and in a good engine amounts to not more than one-tenth. As a most favorable value for fuel consumption of an aviation motor we may assume 0.536 pound per horsepower-hour, which value has been repeatedly reached in aeroplane engines. In dirigible engines figures as low as 0.514 pound have been obtained.

Hand in hand with the reliability goes the demand for durability and continuous maintenance of high capacity. It is here that older constructions of aviation engines sometimes fall down very badly. Only the continuous output which the engine is able to give is to be seriously considered in an aviation engine as distinct from the automobile engine. While the latter is only very seldom required to give its maximum output—and then only for a short time—the aviation engine almost always runs under full load.

Additional specific requirements mentioned include—

(*a*) carburetor action and engine performance must be independent of barometer, of temperature, of dust, and of tilting of engine, (*b*) uniform turning movement, (*c*) balance of engine parts, (*d*) high enough energy in rotating parts to produce a flywheel effect to resist variable propeller resistances and maintain engine speed, (*e*) propellers give best efficiency at speeds lower than are feasible in engines—in some cases as low as half, (*f*) proper cooling of engine to insure lubrication, minimum distortion of metal parts, temporary or permanent, (*g*) locate exhaust discharge away from operator, (*h*) least weight of engine by designing for maximum feasible speed, maximum work per cubic foot of displacement, and least weight of metal of selected kind and cross section.

In a paper read before the institution of automobile engineers (London) in 1912, Mr. A. Graham Clark summarizes the qualities regarded as essential or desirable in an aero-nautical engine, as follows:

(1) Reliability: Failure of the engine necessitates the immediate descent of the machine, if of the heavier-than-air type, which, should it occur at an inopportune moment, may be attended with disastrous consequences.

(2) High power weight ratio:

(3) Economy in fuel and oil:
Are desirable because of the increased radius of action.

(4) Low air resistance: The importance of air resistance becomes more marked with increase in the speed, as the power absorbed in this direction varies as the cube of the velocity. It may be remarked

in this connection that the horsepower required to propel a flat plate 3 feet in diameter through the air is increased from about 6 to over 16 by increasing the relative velocity of the plate to the air from 50 to 70 miles per hour.

(5) Controllability or flexibility, although there is not the same need for it as with engines employed on automobiles, is none the less a desirable quality since at low speeds of rotation the propulsive or tractive effort of the propeller is insufficient to move the machine along the ground, and hence the pilot will be able to start up without assistance should circumstances necessitate his so doing. Further, as the engine is not required to develop its full power in horizontal flight and when alighting, the ability to vary the speed during descent is certainly preferable to the crude method of switching the ignition off and on.

(6) Freedom from vibration: The necessity for elimination of vibration as far as possible will be obvious when the slender nature of the supports upon which the engine is carried is realized, especially as vibration of a dangerous character may be set up in the various parts of the machine.

(7) Accessibility: The question of convenience of access is frequently overlooked or, at any rate, disregarded on account of the care and attention which is now given to the class of engine before any extended flight is made. But it must be realized that from commercial considerations alone, apart from the addition to the time during which the machine can be used and which may, under some circumstances, be of value, it would be an advantage to be able to readily examine or dismantle any part, especially when the applications of the aeroplanes are more widely extended.

(8) Silence is desirable in any machine used for pleasure or sporting purposes, but when it is intended for employment on military reconnoissance duties it becomes of increasing importance to be able to manoeuver without giving audible warning of approach, especially at night.

(9) Cleanliness is in the nature of refinement, but it is none the less necessary since a dirty appearance is generally caused either by the oil splashed about during hand oiling or by the exhaust, both of which are objectionable—the former because the part requiring such attention is apt at times to run dry owing to the irregularity of the supply of lubricant, and the latter because it indicates an open exhaust.

Another contribution along similar lines worthy of reproduction is that of Granville E. Bradshaw before the Scottish Aeronautical Society (Glasgow), December, 1913:

There is probably no form of prime mover in existence that is more highly stressed or that has a more strenuous life than the aeroplane, and there is undoubtedly no engine that has greater claims on reliability. The aeroplane, manufacturers' cry for the extremely light engine is probably greater today than it ever has been in the history of aviation. The demands of the authorities who purchase aeroplanes are such that probably as much as 90 per cent. of the factors which determine the most successful machine are governed directly or indirectly by the weight efficiency and fuel efficiency of the engine. By the former is meant, of course, the number of pounds of weight for every horsepower developed. That the engine shall be extremely reliable is, of course, taken for granted.

Among the essential features of all successful aeroplanes are the following:

(1) It shall climb very quickly. This depends almost entirely on the weight efficiency of the engine. The rate of climb varies directly as the power developed, and indirectly as the weight to be lifted. That the aeroplane shall be very efficient in this particular can easily be understood when one remembers that its capabilities of evading destruction from projectiles depend to a great extent on how quickly it can get out of range of such projectiles. It must also be efficient in climbing in order to successfuly rise from a small field surrounded by tall trees which may be necessitated by a forced landing during a cross-country flight over a populous district.

(2) It shall have a good gliding angle; or, in other words, that from any given height it shall be able to glide for a great distance, is also governed indirectly by the weight of the machine, and consequently by the weight of the power plant, because a machine with a heavy power plant must be designed with a larger lifting surface and must be stronger in proportion. With the same lifting surface and head resistance the angle of descent of the heavy-engined machine will be steeper[1] than that of the light machine, as higher speed is necessary to support increased weight.

[1] The heavier machine glides faster, not steeper.

(3) It shall have a combination of fast and slow flying speeds. This is of paramount importance, and one that aeroplane constructors are paying probably the greatest amount of attention to. The capabilities of a machine to fly slowly as well as fast depend almost entirely on the adoption of an extremely light and powerful engine. If the machine is designed for very high speed, a slow speed is only possible by the machine, and consequently the power plant, being very light. Note.—The wing characteristics of lift and drift are also very important.

(4) It shall be safe to handle in all winds, both with and without the engine in operation. Aeroplanes have been built that will carry as much as 15 to 20 pounds per square foot of supporting surface, but constructors nowadays agree that the lightly loaded machine is the safer to handle, and the average loading on the planes is today generally in the neighborhood of 4 or 5 pounds per square foot. A heavily loaded machine depends to a great extent on high speed of flight in order to maintain it in the air. Should the speed fall, unconsciously to the pilot, through loss of engine power or from any other cause, the control becomes sluggish and will not answer quickly, the aeroplane, unless the nose is put down very quickly to increase the speed, flounders about like a log in the sea, and generally ends in a side slip, and one of these terrible nose dives that have deprived us of so many of our best pilots. The life of the pilot of the heavily loaded machine is more dependent upon the good behavior of the engine than is the life of the pilot of the lightly loaded machine, and the latter could probably go on flying in search of a good alighting ground with two or three cylinders not firing at all.

(5) It shall be able to remain in the air for long periods. This depends chiefly on the oil and gasoline consumption of the engine and without efficiency in this respect, the extremely light power plane is practically useless, as flights of only a few minutes' duration are not likely to be of much use in serious warfare.

All the essentials just enumerated and particularly the last depend of course on the engine being absolutely free from any breakdown, which point has not been dealt with as it is not a debatable one. We are all without doubt of one mind on this matter.

Finally there are reproduced below some extracts from the Notice to Competitors issued by the British Government for 1914 competition for naval and military aeroplane engines, all bearing on the question of engine-service requirements:

1. REQUIREMENTS TO BE FULFILLED.

(*a*) Horsepower, 90-200. (*b*) Number of cylinders to be more than 4. (*c*) Gross weight per horsepower, calculated for six hours' run not to exceed 11 pounds. The gross weight includes engine complete with carburetor devices connected up (exclusive of the gasoline tank and pipes), all ignition and oiling appliances, starting handle, all cooling appliances—e. g., fan guarding, air guides, and any water radiator and water connections and any oil left in the engine. It will also include all fuel and oil supplied for six hours' run and all oil containers and pipes therefrom.

The gross weight per horsepower is the total weight of the engine divided by the figure for horsepower, below which the output has not been allowed to fall throughout the siz hours' run, with a tolerance of 3 per cent. for small variations and inaccuracy of measurements.
(*d*) Shape of engine to be suitable for fitting in an aeroplane.

2. DESIRABLE ATTRIBUTES OF AN AEROPLANE ENGINE.

(*a*) Light total weight. (*b*) Economy of consumption. (*c*) Absence of vibration. (*d*) Smooth running whether in normal or inclined position and whether at full power or throttled down. (*e*) Slow running under light load. (*f*) Workmanship. (*g*) Silence. (*h*) Simplicity of Construction. (*i*) Absence of deterioration after test. (*j*) Suitable shape to minimize head resistance. (*k*) Precautions against accidental stoppage—e. g., dual ignition. (*l*) Adaptable for starting otherwise than by propeller swinging. (*m*) Accessibility of parts. (*n*) Freedom from risk of fire. (*o*) Absence of smoke or ejections of oil or gasoline. (*p*) Convenience of fitting in aeroplane. (*q*) Relative invulnerability to small-arm projectiles. (*r*) Economy in bulk, weight and number of minimum spare part equipment. (*s*) Excelence of material. (*t*) Reasonable price. (*u*) Satisfactory running under climate variations of temperature.

In the recently issued specifications issued by the United States Navy Department a number of items appear bearing on engine-service requirements, which are abstracted and reproduced below for comparison:

"They shall be well balanced and produce no excessive vibration at any power. To be capable of being throttled down to 20 per cent of the revolutions per minute for full power. The weight of the engine complete, with ignition system, magnetos, carburetors, pumps, radiator, cooling water, and propeller not to exceed five pounds per brake horsepower. Engine to be fitted with some type of compression release as a means of stopping it. To be fitted with a practical means of starting from pilot's seat when installed in an aeroplane. All moving parts not lubricated by a splash or forced lubrication system to be readily accessible for inspection, adjustment and oiling. Ready means shall be provided for checking and making adjustments to the timing of the engine. To have an accurate and positive lubricating system which will insure a uniform consumption of lubricating oil proportional to the speed of the engine. All parts subject to corrosion to be protected from the effects of salt water. To be fitted with an approved attachment for obtaining the revolutions per minute. To be provided with means for preventing fire in case the engine is turned upside down. A hand-throttle lever and connections to carbureter to be provided that can be applied for convenient operation by the pilot. This lever to be designed with a positive means of retaining it at the throttle adjustment desired by the pilot. All bolts and screws without any exception to be provided with an approved positive means for preventing backing out due to vibration. No soft solder to be used in any part of the power plant."

Among the conditions for acceptance tests the following stipulation will be noted: "Motor to be run at full power for one-half hour under conditions approximating operations in the aeroplane in a heavy rainstorm."

At the present time many of the important conditions that an aeronautic engine must fulfill are pretty well settled, at least in kind if not in degree, but every day sees some new attribute announced as desirable, so that while it can hardly be said that aero service requirements for engines are now reducible to rigid specifications, they can be formulated with enough precision to enable an engine designer and manufacturer to undertake production with some prospect of success or acceptance. In so proceeding, however, no designer or manufacturer can afford to ignore past experience in engine construction nor, on the other hand, may old constructions be slavishly reproduced, for what was acceptable yesterday may not be today, and certainly will not be tomorrow.

All these service requirements can be classified under three headings for future more or less minute analysis.

(*To be continued*)

FOREIGN NEWS

AUSTRIA

The official Austrian report for April 18 tells of the great activity of the Italian airmen. The report follows:

"The Italians have been active at several places on the Isonzo front. Two enemy fliers dropped bombs on Triest, two civilians being killed and five wounded. Austro-Hungarian aviators drove the invaders away, chasing them to Grado.

"Our airmen hit an Italian torpedo boat."

FRANCE

One of the most picturesque aerial exploits of the war—a night attack by a French aeroplane on a German vessel in the North Sea—is officially reported in the afternoon bulletin of April 17.

"During the night of April 15-16," the report says, "a French armed aeroplane, flying over the North Sea at a height of 300 feet, threw sixteen shells at a vessel of the enemy. Eleven of these missiles found their mark."

The official bulletin of April 18 tells of the great activity of the French aerial squadrons on April 16-17. French aeroplanes visited altogether eleven points behind the German lines. The report follows:

"On the night of April 16-17 our shells bombarding aeroplanes dropped twenty-two shells on the railway stations at Nantillois (seven miles north of Avocourt, west of the Meuse) and Brieulles (on the left bank of the Meuse, fifteen miles below Verdun); fifteen on Etain (eleven miles east of Verdun, on the Metz Railway) and a bivouac in the forest of Spincourt (about eight miles north of Etain); eight on the cantonments at Vierville and Thillot, northwest of Vigneulles (nine miles northeast of St. Mihiel).

"The same night a French air squadron of nine machines, during an intense fog, executed certain important bombarding operations in the regions of Conflans, Pagny, Arnaville and Rombach."

Raids by two French aerial squadrons stationed on the Salonica front are reported in a dispatch from Athens. One dropped bombs on April 16 on Bulgarian forces at Strumitsa station. The other attack was made on German positions at Bogdantze. Both squadrons returned undamaged.

During the night of April 17 aeroplanes of the enemy threw down seven bombs, one of them being an incendiary missile, on Belfort. It has been reported that two persons were killed and six wounded. The material damage was not important.

Colonel Repington, a military correspondent of one of the English daily papers, pays a very high tribute to the French troops and aviators. His statement is as follows:

"The French aviators deserve the highest praise. During my visit I saw many aviators brave the enemy's anti-aircraft guns with the greatest intrepidity, but I did not see a single German aviator cross our front. In a single day the French accounted for six German aeroplanes without themselves sustaining any loss.

"From my personal experience I am of opinion that the French anti-aircraft guns are superior to those of the Germans, and it also appears to me that our allies employ this artillery upon more scientific principles."

The official report for April 22 contains the following:

"The aviation corps is active. The French aeroplane which flew over Sofia returned unscathed from its 400-mile trip. It dropped four bombs of large calibre on a Zeppelin shed at Sofia.

"Two French aeroplane squadrons bombarded the German camp at Petritch yesterday, and another squadron dropped bombs on German troops concentrating in the region of Doiran. German fliers attacked Grassouli, but did no damage."

Constant Duclos, a private in the Marine Fusiliers, who won the War Cross for bravery in Flanders, also holds the record in the forces of France for making descents suspended from a parachute.

With a parachute invented by Pilot Lieutenant Juchmes, of the French Army Aviation Corps, Duclos has dropped nineteen times since November, 1915. His first descent was from an aeroplane at a height of 1,000 feet; his nineteenth from a height of 4,000 feet, or nearly four-fifths of a mile. The parachute will be fitted on all French airships and aeroplanes.

On April 22, one of the bombarding squadrons threw twenty bombs on enemy camps near Azannes and Villiers-Mangiennes (railway centers northeast of Verdun behind the German lines).

GERMANY

The official German report for April 17 is interesting in that it tells of the success of two different methods in bringing down an enemy aeroplane. The bulletin says:

"Near Pervyse, Flanders, an enemy aeroplane was brought down by our anti-aircraft guns close behind the Belgian lines, and was destroyed by our artillery.

"First Lieutenant Barthold brought down, northwest of Perrone, his fifth enemy aeroplane, a British biplane. The pilot was dead and the observer seriously injured."

The official report for April 21 tells of two engagements of German aircraft. On April 20 an aeroplane squadron of the army of General von Bothmer dropped a number of bombs on railways and railway buildings at Tarnapol, and on the Balkan front German airmen attacked places in the Vadar Valley and to the west of the valley where French troops are situated.

In a recent issue of the Osnabruecker Zeitung appears a letter written by a young German aviator who made a flight over Verdun.

"This morning," he says, "I made my third flight over Verdun. The weather was stormy when I started, at half-past 10 o'clock. I flew over Gravelotte, St. Privat, and then over Verdun, which I encircled, meanwhile dropping my bombs. I flew back to my base by way of Etain and Dubuy. Most of the time I was in a mass of clouds, and in order to see anything at all I had to descend every now and then. I was never higher than 2,000 metres over Verdun, and sometimes only 1,300 metres. When over Verdun I was constantly bombarded but escaped unhurt. My aim was good and I could see the spot where my bombs fell and exploded."

The following official communication was issued April 24:

"Ten German aeroplanes on Saturday attacked the Russian air station at Papenholm, on Osel Island, in the Gulf of Riga, and dropped 45 bombs. Very good effects were observed."

GREAT BRITAIN

Comment in English newspapers calls attention to the fact that men examined for commissions in the Royal Naval Air Service are questioned about their participation in athletics. Those who have played cricket and football to any great extent are given the preference in the granting of commissions. The explanation, according to the authorities, is to be found in the fact that men who have taken part in those sports have a keener and quicker eye. This enhances their value as bomb droppers, and for that reason makes them of particular value to the flying arm of the service.

In telling of the recent air and sea raid carried out by the British on the German coast the report says:

"The marvel was that under the circumstances which prevailed, the airmen made any attempt to ascend at all. They defied the elements, however, and went off from their mission with an eagerness eloquent of the spirit of the service."

According to a dispatch from Salonica the British aerial attack on Constantinople on April 14 did more damage than was at first believed. The account says that two bombs burst in on the war ministry. The dispatch adds that another bomb burst in the powder factory of Makrekui, which was blown up. There were numerous casualties.

ITALY

The official report for April 19 is as follows:

"Enemy hydro-aeroplanes on Sunday night raided Treviso and Motta del Ivenza and smaller places, dropping thirty bombs. Nineteeen persons were killed and twenty wounded and some damage was done to public buildings. One of the enemy's hydro-aeroplanes was brought down at Grado, both aviators being made prisoners."

Austrian hydroplanes dropped bombs on Treviso, within twenty miles of Venice, and on other Italian towns, in the province of Venetia, according to an official Italian statement issued on April 18:

Thirty bombs were dropped by the aeroplanes, and ten persons were killed and twenty injured. One of the Austrian aircraft was brought down.

The statement is as follows:

"Enemy hydroplanes last night flew over Treviso, Motta and Dilivenza and other localities, dropping thirty bombs and killing ten and wounding twenty persons and damaging some buildings. One hydroplane was brought down at Grado and two aviators and one officer were taken prisoners."

On April 20 an enemy aeroplane dropped bombs on Bassano, but without causing loss of life or property.

On April 20 several Caproni aeroplanes flew over the war hydroaeroplane station near Trieste and dropped sixty bombs, which caused visible disastrous results. The aircraft returned safely to their base, despite a violent anti-aircraft artillery fire."

On April 22 Crown Prince Humbert made a short flight in an aeroplane attached to the fleet at Tarento. The Crown Prince was 11 years old on September 15 last.

INDIA

The Punjab aeroplane fund, raised in the province for the purpose of providing aeroplanes for the British army, has been closed with a total of 96,000 pounds sterling ($480,000). This will pay for forty-eight armored aeroplanes.

MEXICO

A runaway aeroplane on April 30 caused the death of an army officer and made necessary a long chase in automobiles to recover what was left of a fine biplane belonging to the Aviation Corps of the East. Details of the peculiar accident were not made public at the War Office, but it is known that the pilot was thrown out of the machine during trials held at the Valbuena Plains, and that the machine flew pilotless to the distant mountains, where it was wrecked.

RUSSIA

Later reports of the recent attempt on the life of the Czar, by Austrian airmen, say that the emperor was injured, narrowly escaping death. Previous accounts made no mention of the Czar's injury. Generals Brussiloff and Ivanoff, who were in charge of operations at the time of the Czar's visit, were bitterly reproached.

On April 22, in Galicia, hostile aeroplanes raided Tarnapol, on which they threw a number of bombs. South of Novo Alexiniec a German aeroplane was found which had apparently been destroyed by fire. It had belonged to the squadron which raided Tarnapol.

Late official reports from Russia make the claim that the German aerial sqadrons are using deception in the marking of their planes. They state that the German planes have the Russian distinctive circles painted on their wings.

TURKEY

The official war bulletin for April 18 says that on April 14 an enemy aeroplane from the direction of Enos (on the Gulf of Saros, north of Gallipoli Peninsula) flew over Adrianople, dropping two bombs without effect.

A British camp on the Suez Canal has been attacked by a Turkish aeroplane, the War Office announced on April 24. The aviator dropped bombs and returned successfully. The announcement is as follows:

"On April 20 one of our aeroplanes carried out a flight of 300 kilometres (about 200 miles) over the desert of El Kantara, on the Suez Canal, in three hours and there pelted successfully with bombs enemy troops in camp. The aeroplane returned undamaged. Enemy aeroplanes flew over Phocea, a suburb of Smyrna, where some bombs were thrown without effect."

The official report from Constantinople on April 19 says that a hostile seaplane ascending from a ship off Gaza, on the coast near Palestine, was chased off by two Turkish machines. Turkish reports to the contrary, the numerous accounts of the fall of Trebizond indicate that aeroplanes gave able assistance in the attack and eventual capture of the fortress.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
Youngstown, Ohio

DENVER MODEL AERO CLUB
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BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Illinois Model Aero Club

By Arthur E. Nealy.

President Hitt and Mr. George Weaver of the club recently gave a model exhibition before the Speedway Park Association members at the Congress Hotel, Chicago. Mr. Weaver read a short paper on models and was followed by Mr. Hitt's demonstration of model control. The following Sunday our President was given an invitation by Speedway officials to visit Speedway park with the entire model club and witness the auto trials then in progress.

The Villard distance trials were held last Sunday. There was an excellent turnout, and one flight of over four minutes and 2,600 feet made. The elimination trials were held at Ashburn Flying Field.

At the last Friday's meeting of the club Messrs. Cook, Lathrop and Pease delivered talks to new members of the club on pertinent subjects connected with the present National Model Competition. Upon this same evening, Messrs. Weaver, Laird, Borklandtt, Hitt, and Nealy were giving a model exhibition as the guests of the Chicago Auto Club.

Design for an R. O. G. Model

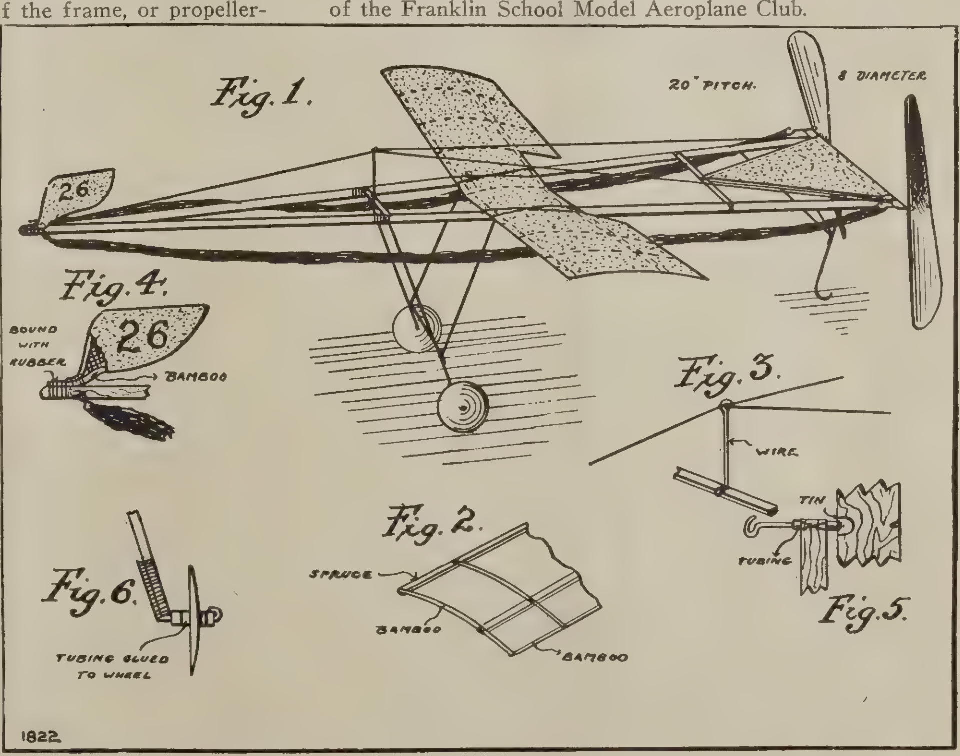
The fuselage consists of two strips of silver spruce, ¼ in. by 3/16 in, at the center, tapering slightly towards the ends and out to a streamline form. The frame is bound at the front, fitted with the usual hooks, and glued.

Running across the frame 12 in. from the apex is a bamboo brace, 3/16 in. wide, out to streamline form, and extending upright from this brace is a 2½-in. piece of 1/16-in. piano wire, fitted with a loop at the top, through which extend bracing wires, as shown. The construction is clearly shown in Figs. 1 and 3. The rear brace of the frame, or propeller-bar, is of bamboo, ¼ in. wide by ⅛ in. in thickness, out to streamline form, and 12 in. from this rear brace is another brace of bamboo, and extending from this brace to the rear brace are diagonal strips of bamboo, this space being filled in with fabric to form the tail.

The main planes measure 24 in. span, with a chord of 4½ in. at the ends, extending in for 8 in. The entering edge and main beam of the plane is of 3/16 in. wide by 1/16 in. spruce, cut to streamline form, and the trailing edge is of ⅛ in. square bamboo. The plane and tail is covered on top with silk treated with Ambroid varnish. The fin is constructed of a single piece of bamboo, and is 2½ in. high and 3½ in. long. Fig. 4 shows the construction of the same.

The propellers are cut from a solid block of white pine, and are 8 in. in diameter, with a pitch of 20 in. They are given a coat of white shellac.

The bearings consist of ½ in. lengths of tubing, bound and glued to each end of the propeller bar. Bent around the propellers at the hub are small strips of tin, as shown in Fig. 5.



Aero Science Club of America

At the last meeting an election was held for officers to serve for the coming year. In view of the good work rendered by the officers of the past year they were unanimously reelected. They are as follows: Mr. Edward Durant, Director, Mr. Harry Schultz, President, Mr. George Bauer, Vice-president, Mr George A. Cavanagh, Secretary, Mr. R. C. King, Jr., Assistant Secretary and Mr. Frank Bloomfield, Treasurer. At the conclusion of the election Mr. Durant, Director, spoke to the members concerning the progress made by the Club in general. During his address he brought to mind the new world records, which were established by the members during the year of 1915, and of the developments which had taken place in regard to compressed air and other types of mechanical motors.

Another speaker of the evening was Mr. Arthur O'Neill, who by the use of drawings, and blackboard sketches described to the members the operation of an inherently stable machine on which he has been experimenting for some time. The talk by Mr. O'Neill was most interesting in as much as he described a number of new and ingenius methods of operating aeroplanes. The members greatly appreciated Mr. O'Neill's words.

Messrs. Schober and Thiele announced that during the afternoon of April 22nd, one of Mr. Schober's compressed air models made an unofficial flight of 52 seconds. The motor used was of French design.

The first contest of the National Model Aeroplane Competition, which was scheduled to take place April 23rd was postponed until the 30th.

Mr. C. W. Meyer represented the Club at the last meeting of the Franklin School Model Aeroplane Club.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Anything Possible These Days

"Impossible."
"But I saw it."
"Impossible—ridiculous!"
"I tell you it did."
"And I say it didn't, because it couldn't."
"I was there and witnessed it."
"Do you mean to tell me that he was killed by a bolt from a clear sky? Do you expect me to believe such a yarn?" he shouted.
"That's just what I'm telling you. The bolt dropped from a passing aeroplane."

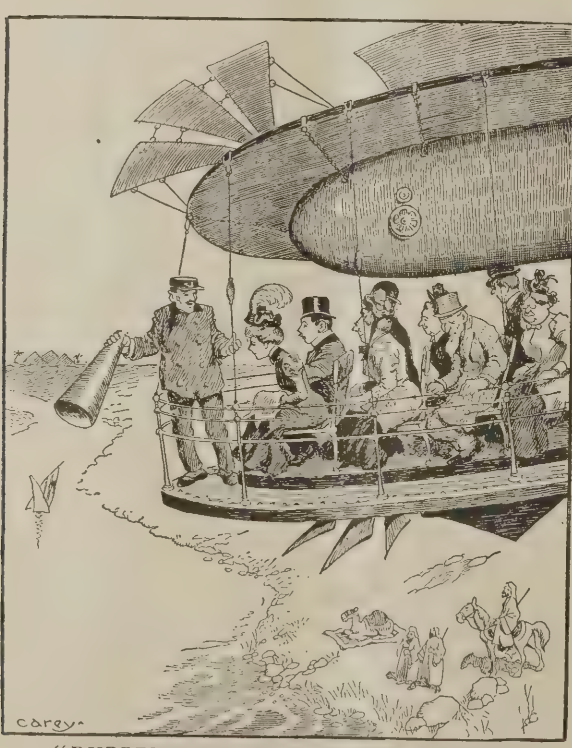
Zipp—Why does an air pilot never have to blow his nose?
Yipp—Because it's blue, I suppose.

Aviator: Yes, they got twenty-four bullets out of me! They ought to have sent me to a munitions depot—not to a 'orspital!

1st Mechanic: Why do you smoke such a long pipe?
2nd Mechanic: I am trying to keep away from tobacco.

Place of Honor

"Yes, Jones, the glide expert, is a prominent member of our fraternity."
"What's his official capacity?"
"Oh, several gallons."—*Siren.*



"RUBBERNECKING" OF THE FUTURE.
"Ladies an' gents, we are now crossin' d' river Nile. To me right is d' pyramids of Egypt. We will next cross d' Great Desert an' see d' caravans an' d' natives catchin' wild ostriches. Next stop, One Hundred an' Twenty-fifth Street, New York."

At the Gate of the Field

1st Private: They say the Dean is losing his mind.
2nd Private: I shouldn't wonder. He gave me big pieces of it a number of times.

Hopeful

Aviator (who puts up at a farm house over night): Splendid morning, sir.
Grouchy Farmer: Naw, it ain't. It's rainin' pitchforks.
Aviator: Well, cheer up, they'll come handy for the hay later on.

Down South with the Exhibition Flyers

"Ah got a horrible shock yistiddy."
"Howcome, honey, howcome?"
"Why, ah wuz eatin' a piece of fruit cake and a big currant passed right froo mah mouf."

So Say We All of Us

1st Aviator: I have a friend who suffers terribly from the heat.
2nd Aviator: Where does he live?
1st Aviator: He isn't living.—*Lehigh Burr.*

Our Platform

If any one has—
Died.
Eloped.
Married.
Divorced.
Left town.
Embezzled.
Had a fire.
Sold a farm.
Had a baby.
Been arrested.
Come to town.
Bought a home.
Committed murder.
Fallen from an aeroplane.
That's news—Telephone us.
—*The York* (*S. C.*) *News.*

Dear Old Lady: My dear sir, how well you swim. Where did you learn?
Lifeguard: Well, you see I was a traffic policeman at Venice.

Frantic Aeroplanist: Oh, officer! some one has stolen my spark plugs.
Officer: Are you sure ye had 'em when ye left home?

Prof. in Math. Class: There are two aeroplanes going in the same opposite direction, one fifty miles an hour and the other at sixty. How far apart will they be when they meet?

Mechanic: Ever have any money left you?"
Friend: Yes, and it left me quick.

Old Lady Customer: Do you guarantee these nightgowns?
Sly Young Clerk: They can't be worn out, madame.—*Stanford Chaparrel.*

She (thoughtfully): Do you ever think much about reincarnation, dear?
Mechanic (otherwise): Think about it? I eat it nearly every day—only we call it hash.

On the Field.

Ted: Wish I was in your shoes.
Ned: Why so?
Ted: Mine leak.

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Change the Administration!

SECRETARY BAKER has asked less than one million dollars for army aeronautics, which is not more than one-fifth of what the army needs; Secretary Daniels has asked for only two million dollars for naval aeronautics, cutting down Captain Bristol's estimate to one-seventh of what was recommended, and conditions are just as bad in every branch of the service. Congress seems to be inclined to give first what is asked—and Congressmen and Senators, replying to remonstrations say: "We are giving everything the Administration has asked for!" The answer is obvious.

Our Retrogressive Naval Policy

AFTER a year of unfulfilled promises made to the naval militias of twenty-two States, the United States Navy Department finally has ended the hopes of the naval militiamen for the organization of the flying corps by the announcement that the department can do nothing to aid the would-be citizen aviators.

About a year ago Secretary Daniels caused to be communicated to the heads of the Naval Militia organizations of the various States word that the Navy stood ready to aid in the formation of militia flying sections. The militiamen were encouraged to form aviation detachments and were promised the use of naval seaplanes and flying boats. It was said that at least two such craft would be supplied to each militia battalion. Promises also were held out for the training of naval militia aviators in the Navy flying school at Pensacola.

As a result, many States, New York in the lead, formed a flying arms to their citizen seaman organizations. Enthusiasm, fostered by the Navy Department, resulted in many volunteers, both among officers and men, for flying instruction.

Interested civilians shared in the enthusiasm, and when the promises of the Navy Department began to drag from month to month offered to step into the breach. As a result, many of the naval militia battalions were supplied with aircraft by private contribution.

Glenn H. Curtiss gave two flying boats, one to the First Battalion, N. M. N. Y., with headquarters on the North River, and one to the Third Battalion, with headquarters in Buffalo. A group of citizens, headed by Vincent Astor, presented an aerial scout to the Second Battalion of Brooklyn.

Inglis M. Uppercu gave a seaplane to the naval militia of New Jersey. The naval militiamen of Chicago and of San Francisco fared equally as well. Naval militia battalions at other parts of the seacoast, however, found their pains of organization wasted. Enthusiasm in the aerial arm died while the Navy Department held back promised support.

The recent communication from Commander Bassett makes it plain that not only are the naval militiamen to give up all hope of aid from the Navy in the way of machines, but that there is little possibility of naval militia officers getting training in aerial scouting at the Pensacola school, despite the fact that almost all of the Navy aviation appropriation of last year has been sunk in that station.

The Executive Board of the Aero Club last night issued a statement concerning the communication from Commander Bassett.

The communication, which also states the policy of the Navy Department regarding the instruction of militia officers in aviation, reads:

"1. The Navy Department has adopted the following policy in regard to line officers (Aeronautic Duties Only) and enlisted men (Aeronautic Branch):

"(a). Line officers (Aeronatuic duties only) and enlisted men (Aeronautic Branch) of the aeronautic sections and divisions may be instructed in flying and officers and enlisted men (in limited numbers), will be sent to the Naval Aeronautic Station, Pensacola, Florida, for training.

NOTE:—At present the facilities of the Station are such as to preclude the possibility of training enlisted men of the Naval Militia. It is, however, the intention of the Department to take up this training at the earliest practicable date.

"(b). No officer or enlisted man who has not a certificate of eligibility as a flyer will be sent to Pensacola for a shorter period than six weeks. Officers and enlisted men holding certificates of ability as flyers may be sent to Pensacola for periods not less than four weeks.

"(c). No officer or enlisted man will be sent to Pensacola for training unless he possesses a sufficient preliminary education that will enable him to obtain the full benefits of the training.

F. B. BASSETT, JR."

The Executive Board of the Aero Club of America, after considering this communication at its meeting at the Club House, at 297 Madison avenue, issued the following statement:

"Commander Bassett's communication is most startling, and reveals a state of affairs which should be investigated by Congress. It appears by this communication that the Navy Department is not taking steps to make up for its deficiency of aviators and aeronautical equipment. This deficiency is such that only four aeroplanes and nine aviators could be sent to the naval maneuvers at Guantanamo recently, and, owing to the shortage of the personnel of the S. S. North Carolina, these officers had to do ship duty and had but little time to give to aviation. These four aeroplanes were not equipped with wireless instruments, there being only one small ten miles set available for the naval aviation section. Therefore, the fleet could not employ the aeroplanes to spot the fall of shots during the gun firing practice, as is done in Europe. This lack of wireless sets also made it impossible to carry out difficult naval problems, such as are being carried out in Europe, where the aeroplanes direct the movements of the fleet by advising them by wireless of the movements of the enemy's ships.

"In an emergency the U. S. Navy would be even more helpless, from an aeronautical standpoint, than the Army was at the time of Villa's raid on Columbus.

"As the biggest problem is that of getting the personnel necessary for a substantial air service, the only immediate relief obtainable is by equipping the Naval Militia of the twenty-two states having such organizations with aeroplanes and training militia officers at Naval Aviation Schools.

"There should be immediately established four more large naval aviation schools to train navy as well as militia officers, and provision should be made to give at least two aeroplanes to every naval militia organization.

"Unless this is done, we shall find, to our sorrow, in an emergency, that the most important and economic arm is totally undeveloped."

America Must Be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

Mr. Alan R. Hawley, President of the Club, characterized the conditions of Naval aeronautics as "shocking," and the failure of the Navy Department to take steps to provide the Militia with aeronautical training and equipment as "a shameful disregard of this country's safety. The original estimate for aeronautics was $13,600,000 and was slashed to $2,000,000. Unless Congress restores the original sum, our Navy will be in just such a sorrowful plight in case of emergency as our Army was in the Mexican campaign."

"It seems impossible that national safety, public demand, expert advice, and the lessons of the great war can be so totally disregarded," commented Mr. Henry A. Wise Wood, Chairman of the Conference Committee on National-Preparedness, who resigned from the Naval Consulting Board as a protest against Secretary Daniels' suppression of the original report of the General Board of the Navy. "The American public will have an opportunity to protest at the polls in a few months. Until then, Naval aeronautics will have to be supported by public subscriptions and volunteer efforts."

So far the expenses connected with developing aviation in the Naval Militia of the twenty-two States having such organizations have been borne entirely by the National Aeroplane Fund of the Aero Club of America and the organizations co-operating. Since the National Aeroplane Fund was instituted, ten months ago, thirty States have taken up the work of establishing aviation detachments in the Militia. The heads of the land and Naval Militia are anxious to organize aviation detachments and are applying to the Aero Club of America for assistance in getting aeroplanes and equipment, and for training officers in aviation. The Aero Club of America is assisting them as fast as funds are subscribed to the National Aeroplane Fund.

An Independent Air Service

WHEN we have time to deal with fundamentals it will be found absolutely necessary to create an independent air service—an independent fighting force charged with the control of the element of the air. In other words, the aerial service must cease to be the appanage—or shall we say the Cinderella?—of either the Signal Corps or the Navy Department. The new element of war demands a new service. To this it will be replied: "Surely we may do just as well or better of letting the Navy and the Army develop their air services in the directions required by them, rather than by founding a third service which will be apt to create more of the friction, jealousy, and inability for interaction which have so often injured us in the past when co-operation has been required between our fleets and our armies? Here are two sources of waste and muddle; why add a third?" Our answer is that we must run these risks, because without them we shall never get the command of the air.

Any man endowed with a reasonable amount of imagination must surely perceive that if the forces of the air develop as they have developed in the last five years—probably they will develop at a greatly accelerated pace—we shall see the range, carrying power, pace, and combative capacity of aircraft of both sorts raised to such an extent that the present instruments of war, though even now they seem formidable, will be as fishing-smacks to dreadnoughts. This means, of course, that both sea and land, and all that floats and moves on the one or stands and moves on the other will be liable to attack and destruction from the air. It means also that, owing to the nature of the air and the rapidity of movement therein—a rapidity nearly double that of land movement and treble that of the most rapid sea movement—the combatant masters of the air will be able either to destroy the enemy's engines of war at sea or on land, or else to drive them undersea or underground. In either case the combative value of the sea or land militants will be reduced to zero. Air forces may quite conceivably be able to command the sea, and to a great extent command the land, or rather, let us say, will be able to make the use of either sea or land impossible to those who do their business in great waters or move upon the surface of the earth. This does not, of course, mean that the world is necessarily going to become uninhabitable. What it does mean is that the power which wants to live in security must be able to command the air.

Now there is only one way of commanding the air, as there is only one way of commanding the sea. That is by *meeting your enemies in the air and destroying their forces.* Nothing else will serve the purpose. The command of the sea, as Nelson and his predecessors taught us, is not a metaphysical abstraction, but in essence a purely practical matter. The capacity to find out the enemy's ships, fight them, and destroy them, or else, as Sir John Jellicoe is now doing, seal them up in their inland waters, is all that is required. Now what does this mean when translated into terms of the air? It means that a power like Britain, which to live must do business both on the sea and on the land, and do it under what we may call *conditions of high concentration—i. e.,* in a closely packed island community and on equally closely packed waterways—must have an air force that can find out and bring to battle and destroy the air forces of its enemies. Nothing short of this will do. No talking, no metaphysics, no "waiting and seeing" can help us to evade the issue. There is no other way by which we can live as a great nation. Unless in the future we secure the command of the air, not for aggressive but for protective purposes, we shall become as sounding brass and tinkling cymbals. Twenty years hence, perhaps before, as every one will then acknewledge, it will be regarded as utterly futile to talk about the Air Service being an auxiliary of the present great fighting services. The Air Service will be the great fighting service, the service which will seal the fate of nations. We say this, not because the Air Service is a novelty, but because of a plain, undeniable physical fact—the universality of the air. The air is even more universal than the sea. There are certain powers which are entirely inland powers, and others which only have very limited and very inhospitable coasts. But every State, small and great, has been, and must be surrounded for all time by, the circumambient air, and so is a potential Air Power. You may exclude certain powers altogether from the sea by setting them geographical bounds. No nation can ever be excluded from the air. Therefore in the last resort the right to live freely and independently will be won and secured by nations in the air. If all this sounds an exaggeration now, we say without the slightest hesitation that it will soon be the merest string of commonplaces.

It comes, then, to this. Our future safety demands that we shall have more aircraft, and aircraft better manned, better engined and better armed than those of any other Power in the world. That is the ideal for which we must strive, or finally go under. Further, we are as certain as that the sun will rise tomorrow that ultimately we can only reach that ideal by having an independent Air Service, a Service backed by the best brains, and, what is even more important, backed also by the bravest hearts and most ardent souls in the country—by the men who are determined to scale the highest heaven, "even to the throne of Jove himself advance," adventurous youths who will be lured by the glories of air flight to hazard more than did the heroes of antiquity in their search for the Golden Fleece, or our Elizabethan sea-rovers when to the cry of "Westward Ho!" they steeled their hearts to every fate, and cut with their keels the waters of every ocean. Such work must be done through a Service which, while inheriting the noble traditions of both the older fighting Services, is free and unfettered for every experiment, every risk or, if you will, for every blunder, provided only that the ideal can be reached.

The Curtiss Marine Trophy

Keen competition for the $10,000 Curtiss Marine Flying Trophy, which has just opened, is expected this year, and some extraordinary records will undoubtedly be made.

Three entries have already been received by the Aero Club of America, at 297 Madison avenue, New York; two from Philadelphia sportsmen and one from Glenn L. Martin, the maker of the Martin seaplane with which Oscar Brindley won the Curtiss Trophy for 1915. Mr Martin says that California is set on getting the Curtiss Trophy for 1916, and will defend it to the full extent of its resources. Oscar Brindley, who won the trophy, represented the Aero Club of California in the contest. Mr. Martin states that he will build special aeroplanes for the competition if necessary.

The contest for the Curtiss Marine Flying Trophy for 1915 was one of keen interest throughout, and resulted in several remarkable flights. There were twelve entrants, representing five aero clubs, as follows:

Oscar A. Brindley, Martin Military Tractor Hydroaeroplane, Curtiss 90-h.p. motor, representing the Aero Club of California.

Frank H. Burnside, Curtiss Flying Boat, Curtiss 100-h.p. motor, representing the Aero Club of Buffalo.

John Lansing Callan, Curtiss Flying Boat, Curtiss 100-h.p. motor, representing the Aero Club of America.

Lieut. H. A. Dargue, Martin Hydro-Biplane, Curtiss 90-h.p. motor, representing the Aero Club of America.

Robert G. Fowler, Burgess Seaplane, Curtiss 100-h.p. motor, representing the Pacific Aero Club.

Robert Glendinning, Curtiss Flying Boat, Curtiss 100-h.p. motor, representing the Aero Club of Pennsylvania.

Beryl H. Kendrick, Curtiss Flying Boat, Curtiss 100-h.p. motor, representing the Aero Club of America.

Theodore C. Macaulay, Curtiss Flying Boat, K Type Curtiss 160-h.p. motor, representing the Aero Club of America.

David H. McCulloch, Flying Boat, Curtiss 90-h.p. motor, representing the Aero Club of America.

Raymond V. Morris, Flying Boat, Curtiss 90-h.p. motor, representing the Aero Club of America.

Lawrence B. Sperry, Curtiss Flying Boat, Curtiss 90-h.p. motor, representing the Aero Ciub of America.

Clarke Thomson, Curtiss Flying Boat, Curtiss 100-h.p. motor, representing the Aero Club of Pennsylvania.

Seven contestants made flights of over 150 miles, as follows: Oscar A. Brindley, 526 miles; Raymond V. Morris, 501 miles; David H. McCulloch, 450 miles; Theodore C. Macaulay, 427 miles Beryl H. Kendrick, from Albany, N. Y., to Ocean City, Md.; Lieut. R. A. Dargue, U. S. A., 192 miles; Robert Glendinning, 160 miles.

The News of the Week

Curtiss Flying Boat Breaks Record

Theodore McCauley, an instructor at the Curtis Aviation School at Newport News, flying the H-7 model Curtiss Flying Boat, on April 30 established three new world records for a machine carrying seven persons, in addition to setting a new American record for a craft of this type.

Victor Carlstrom, flying the new twin-engine military tractor biplane, the first ever flown in this country, also set a new record for altitude for a machine carrying one passenger when he ascended 16,500 feet. This excelled the former record set April 1 by Stephen MacGordon, by 1,700 feet. He was in the air one hour and thirty-one minutes and reached a height of 3.12 miles. Extreme cold, which caused ice to form on the radiator, made further climbing impossible, although the weather there was warm.

McCauley, carrying six passengers, was in the air 70 minutes and flew 88 miles. This broke the world record for endurance and distance. The third world record broken was for speed, the machine making 100 kilometres, or 62 miles, in 50 minutes. An altitude of 950 feet gave him the American record in this respect. Former records for a machine carrying six passengers were held by a Frenchman, Garaix, and were made April 22, 1914.

The flights were witnessed by a Congressional committee there in connection with the plan to establish an aviation corps for the Coast Guard Service.

These records prove that America leads in water flying machines. Notwithstanding this and the fact that the Allies are at present using 120 machines of exactly the same type, built in this country, the United States has never even tried one out.

Seaplane for Washington's Defenses

A military seaplane may be added to the defenses of Washington. Rear Admiral Robert E. Peary, Maj. J. C. Castner of the regular army, at present adjutant general of the District militia, and others are interested in the project, and an order for the machine may be placed within the next few weeks. The Chamber of Commerce, Board of Trade, Rotary Club and Retail Merchants' Association have been interested in the proposition.

Maj. Castner will take hold of the work, not only because of his official position, but also for the reason that he is a member of the national aerial coast patrol commission, of which Admiral Peary is chairman. Associated with them are John Hays Hammond, Jr., Emerson McMillin of New York, Senator Johnson of Maine, Senator Sheppard of Texas, Dr. E. Lester Jones, superintendent of the United States coast and geodetic survey, and others of national prominence.

In twelve states progress is reported by the adherents of the national aerial commission. The plan being followed, of which Washington is an important strategic unit on the chart, was drawn up by John Hays Hammond, Jr., and takes in the coast defense needs by aeroplane of the entire country, from Eastport, Me., to Cape Flattery, Wash., a long and irregular stretch of more than 5,000 miles.

Aviation at Guard Maneuvers

Approximately $12,000 in cash prizes and at least four handsome trophies will be offered for the aviation events to be held in connection with the great Military and Naval Tournament at the Sheepshead Bay Speedway during the week beginning May 20.

New York City, described by military experts as the most vulnerable point of attack in America, is going to give the country its first practical lesson in actual preparedness, and it is planned to have the aviation features stand out prominently and in a manner never before attempted in the history of flying in a nation not at war.

Packard Twin-Six Tested

The 300-cu. in. Packard aviation engine is being tried out this week on Sheepshead Bay Speedway, it having been fitted to a specially built chassis of great engineering interest. The 2-mile wood track is not yet dry from the recent rains, so that it has not been possible to make any laps at full speed, as it has been thought unsafe to go to the top of the banking. On complete laps the car has been doing well over 100 m.p.h. and on the straightaways 116 m.p.h. is readily attainable. This is not official timing but is conservative checking with the stopwatch.

The engine has twelve cylinders 2 21/32 by 4½ in., giving just a trifle under 300 cu. in. piston displacement, and the gearing gives a crankshaft speed round about 3000 r.p.m. at 100 m.p.h. There are four valves per cylinder line. For these shafts there is a gear drive Peugeot fashion, only this is arranged at the flywheel end instead of in front. An especially striking feature is the use of Delco ignition with a storage battery and a small Bijur generator; there is no mag-

J. G. Vincent, vice-president, and Ralph de Palma have been driving the car in these preliminary trials. It is understood that the car is shortly to return to Detroit for examination and may be back on the speedway in a few weeks.

Sloane military tractor, with rapid-firing gun used by the Aviation Section of the N. Y. National Guard

Curtiss Plant to Remain at Hammondsport

At a meeting of the board of directors of the Curtiss Aeroplane and Motor Corporation, held in New York City on the 13th day of April, 1916, it was unanimously resolved that it be the fixed and permanent policy of the corporation to make, develop and improve the motor plant at Hammondsport, and not only build there the latest type of OX motors, but also other models of motors as they may be from time to time desired.

Andermat Aeroplane Tested

The double motored, double propelled tractor biplane, constructed by the Andermat Aeroplane Co., at Sunnydale, California, received its initial air tests on April 17.

Roy Francis, the San Francisco aviator, piloted the huge craft, which has a wingspread of seventy-two feet, across a mile-wide field, made a short turn and landed within only a few feet of the starting point. At no time was Francis more than fifty feet above the ground, but the flight was termed remarkably successful because of the size of the craft.

The machine is equipped to carry three persons, including the pilot in an inclosed body from which bombs could be dropped. It has a carrying capacity of 800 pounds useful load, such as ammunition and provisions. The wings of the cruiser spread seventy-two feet and it measures forty feet from the nose to tip of tail. It weighs approximately a ton and a half and is propelled by two Andermat twin four V-shaped engines, which develop 120 horsepower each. The total carrying capacity of the cruiser while in the air, including the useful load, is 2,275 pounds.

The Andermat people believe that they have the ideal machine for the Alaska mail service. The Andermat Aeroplane Company is backed entirely by California capital. Robert P. Matches, of the Gray Taxicab Company, of San Francisco, is the president of the concern, and W. G. Loomis the general manager.

Preparedness Exposition

The first showing in the East of the Official Naval Exhibit will take place at the Sea Beach Palace, Coney Island, as part of The Preparedness and Prosperity Exhibition, open for visitors from May 30 to October 1, 1916. This Naval Exhibit is the one which aroused so much interest and admiration at the Panama-Pacific Exposition. The Honorable Josephus Daniels, Secretary of the Navy, having in view the spirit of preparedness which is now prominent in the minds of the general public, has ordered the display. Admission will be free and band concerts will be given daily. It is expected that more than ten million people will witness the Exposition. The management expects to have the aerial side of preparedness well presented.

Federal Aircraft and Motor Corporation Enters Manufacturing Field

With the completion of the organization of the Federal Aircraft and Motor Corporation, which is being financed by a group of New York bankers, another aircraft manufacturing plant enters the most promising commercial field in America to-day.

The election of Mr. Walter Edward Kittel to the presidency of the company at the first meeting held recently assures that the company will be guided by an experienced man who has had over eight years of practical experience in the aircraft business.

The Federal will not only manufacture machines of all types, but has made arrangements for operating a school at New York City, and it is understood that several contracts have already been negotiated with well-known yacht clubs which assures the company a substantial income from training the members of the yacht clubs during the summer months.

The company has conducted extensive experiments with aeroplanes and one of these is fully described in another part of this issue of Aerial Age.

Among the directors are such well-known men as Mr. John Gibbons, a member of the banking firm of Post Bros. & Co., New York Stock Exchange; Mr. Albert Hicks, treasurer of the Hudson Safe Deposit Co., and for many years identified with the banking business in New York; Mr. H. Clark MacCully, also connected with a New York Stock Exchange house, and others.

In addition to the 100 h.p. Federal machines of both Pusher and Tractor type, the company has already purchased a Curtiss flying boat and Martin Army tractor for school purposes.

An Explanation

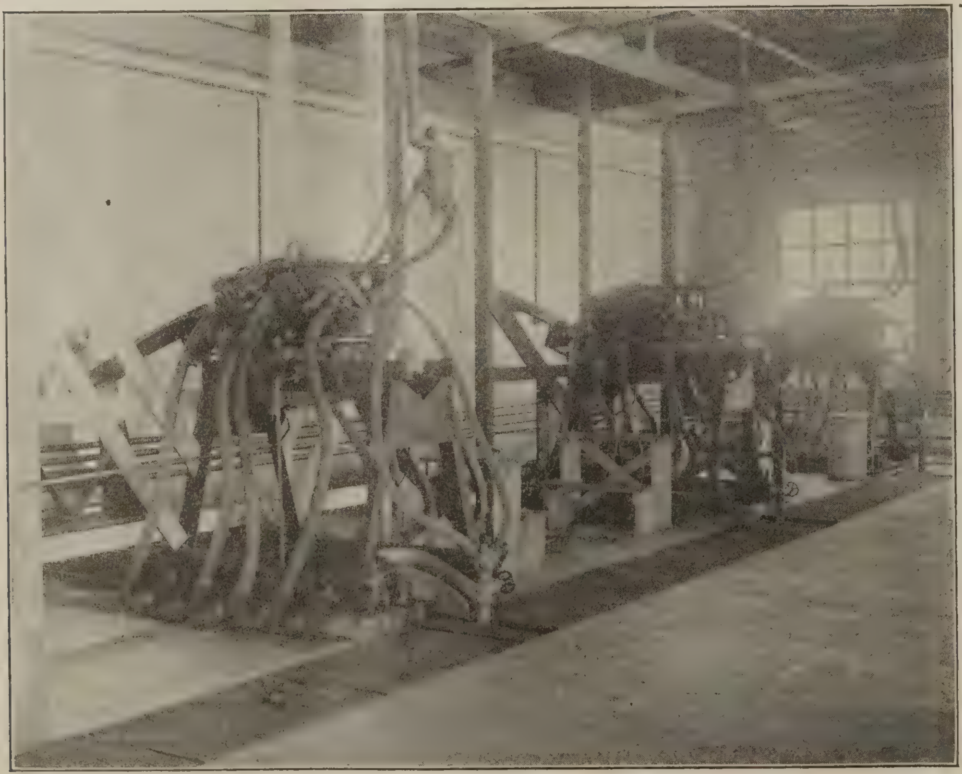
We have received a communication from Lieut. Edgar S. Gorrell of the United States Army section with the forces "Somewhere on the Punitive Expedition," which we have pleasure in printing:

"Aerial Age Weekly,
116 West 32nd Street,
New York City.

"Gentlemen:—

"I understand that some of the daily papers are giving me the credit of being the pilot of an aeroplane carrying Lieut. Dargue as a passenger and breaking the cross country record for pilot and passenger. As I cannot ascertain what papers are making this incorrect statement, I request that you please do me the favor of publishing the fact that the credit for the flight in question is not due to me. The credit for this flight is entirely due to Lieut. Herbert A. Dargue, U. S. Army, as he was the pilot of the aeroplane and I was only his observer.

"Yours very truly,
"Edward S. Gorrell,
"First Lieutenant, Aviation Section, S. C., U. S. Army."



The testing plant of the B. F. Sturtevant Co., at Hyde Park

Thompson Makes Speed Record

While flying with a passenger in the Hall-Scott motored Sloane tractor at Garden City, De Lloyd Thompson flew a mile in $33\frac{1}{5}$ seconds, according to observers on the field. The record has not yet been homologated by the Aero Club of America.

The previous record for the same distance, when the aviator carried a passenger, was held by Glenn L. Martin. His record was $36\frac{3}{5}$ seconds.

Miss Marian Tiechner was the passenger carried by Mr. Thompson during his flight.

Garden City Activities

Last Sunday saw the real beginning of the season activities at the Garden City Aerodrome. While the boys of the 1st Aviation Detachment, National Guard, New York, have been most loyal in their regular attendance at the field, still, Sunday was the first day this year that the attendance amounted to anything. And those who came, in spite of a stiff breeze, were treated to some very good flying, with three and four machines in the air at a time. Let us hope that we continue to have fine Sundays, both as far as weather and attendance are concerned.

The members of the 1st Aviation Detachment have good reason to be proud of their equipment, and of the earnest work on the part of some of the men it represents. At present they have three up-to-the-minute machines in active service and three very able instructors. There are a model J. N. Curtiss, with a Model Ox-2 90-100 H.P. Curtiss motor, fitted quite completely, in fact, a sister machine to those recently supplied our government for Mexican service, and supplied England in large numbers; a big Sloane battle-plane, with a 125 H.P. Hall-Scott 6 cylinder vertical motor; and a Model T 2 Thomas, with a Model Ox-2 90-100 H.P. Curtiss motor. With these machines are "Tex." Millman, who has been teaching the boys on the two Gallaudets for some time; Frank Burnside, whose services have been kindly placed at the command of the National Guard by the Thomas Company, and H. W. Blakely, who handles the big Sloane with the ease of a master. We must not forget the mechanicians, for Trion, "Louie," "Nick," and Gist are always on hand to keep the propellor spinning.

By the way that little T 2 has some real speed tucked under its belt.

We saw but little of "Tex" Sunday as he was certainly a very busy man. There were several passengers to be taken up in the "Schmidt,"—some of them of the feminine sex—and after that, "Tex" jumped right into the Curtiss and kept her up the rest of the afternoon with student guardsmen.

Did you know it's the "1st Aero Company, New York National Guard" now?

Art Heinrich took up the Gyro engined Heinrich tractor of the General Aeronautic Company, with Fred Eden and another passenger. They quite promptly got lost in the fog which was blowing quite low and caused some little uneasiness among the spectators. We all know that Art does not bat an eyelash at going up with a cylinder or so missing, but why run the unnecessary risk of taking two passengers into a dense fog of the kind he encountered Sunday? An accident would only mar the record of the field, that, for this year, is beautifully clean.

Nick should get some white paint on the ball of the flag pole on the Sloane hangar, else Blakeley might sometime drop the necessary inch to have it off, in some of his future landings.

There was considerable excitement on Saturday when Haldeman Von Figyelmassy tried out his new Sloane "Tabloid," a beautiful little tractor "looper" fitted with Curtiss control. Figyelmassy is an experienced pilot, but had never handled a tractor, so the experience was interesting, and, we imagine, hair-raising. The result was a crushed wing that will be quickly repaired. Figyelmassy is to do some fine educational work in Philadelphia in conjunction with the "Preparedness" movement, and it is to be hoped the machine will soon be in shape again as the work is of importance.

Incidentally, have you seen the insignia of the "Roughnecks"?

Sunday was also a sort of "Reunion Day," as several of the old flyers were back. "Bob" Fowler, F. C. G. Eden, Guy Gilpatric, and Leonard Bonney were on the field with the palm of their hands itching for the feel of a wheel. We trust they come often, and bring some good machines with them.

"Gill" says the new M.F.P. steel tractor, the creation of Walter Phipps, which performed very credibly in Canada recently, will be on the field this week. This form of construction has not been seen here since the days of the Fairchild Monoplane, and its arrival is looked forward to. Mr. Fairchild is also associated with the M.F.P. machine, as the F. would indicate. Col. Miller, of the Polson Iron Works, Toronto, Canada, where this machine was manufactured, supplies the M., and the designer, Walter Phipps, is responsible for the P.

The Curtiss "Baby" tractor, which underwent air tests at Newport News recently. It has a wing spread of 24 feet and is equipped with an Ox-2 90-100 h.p. Curtiss motor.

THE "FEDERAL" PUSHER BIPLANE

THE Federal Pusher Biplane has been successfully flown on a number of occasions, and the pilot's commendation of its ease of control and comfort experienced while in flight has justified the designer's efforts in the production such a machine.

PLANES.

The planes have a span of 36 feet, and a chord of 5 feet 6 inches, giving a supporting area of about 400 square feet. In order to give inherent stability, the planes are swept back at a slight angle. Upper and lower planes are of equal area. Main beams through the planes are of specially selected ash, and ribs of spruce. Planes are covered with the finest imported Irish linen, doped with five coats of special aero varnish, and three coats of Valspar. This treatment renders the covering proof against gasoline, oil and water.

Six-foot streamline struts of imported mahogany are used between the planes. Tests have convinced the constructor that this wood is stronger than ash, and at the same time a trifle lighter in weight. The struts are finely finished in their natural color, presenting a pleasing appearance.

Strut fittings (as well as all the other fittings throughout the machine) are of the best grade sheet steel. These are formed in one piece by a single operation with a specially designed stamping machine. Roebling steel cable is used throughout for wiring, and the entire plane is double-wired. Connection between the wires and strut fittings is made by employing small cotter pins, which can be removed in a few seconds when it is desired to remove a wire. This feature greatly facilitates replacing wires that may become unsafe or broken.

Outriggers are of one-inch steel tube filled with spruce to increase their strength. Spacing struts between the outriggers are of oval steel tubing, fastened to the outriggers by means of stamped steel clips. All is cross wired with steel cable.

The stabilizing plane has an area of about 30 square feet, and the elevator flaps have an equal area. The stabilizing fin has an area of 6 square feet and the rudder about 10 square feet. These large areas cause quick-acting and positive control, and are easier for a beginner, as well as for an experienced pilot, to handle.

NACELLE.

As the accompanying illustrations show, the nacelle somewhat resembles in outline the hull of a flying-boat, lacking only the tail extension, and is formed to create little head resistance. It is built up of ash, covered with sheet steel, and the streamlines have been carefully designed. The finish is similar to that used on automobiles, black enamel, with stripes of English vermillion. Pilot and passenger (or pupil) sit side by side, with enough room for freedom of movement, and the cockpit is formed to deflect the wind from the occupants. Seats are provided with "Ianasilk" cushions, and in case of a forced landing in the water these cushions may be used as life preservers, being capable of sustaining the weight of two men.

Under the seats is a space where tools, extra cable, etc., may be kept, and many repairs can be made in case the machine should land a distance from the hangar. Two fuel tanks are built into the nacelle, one on either side of the motor, held in place with two bolts. They may be removed for cleaning, etc. Each tank has a capacity of about 21 gallons, sufficient for a flight of over five hours.

MOTOR.

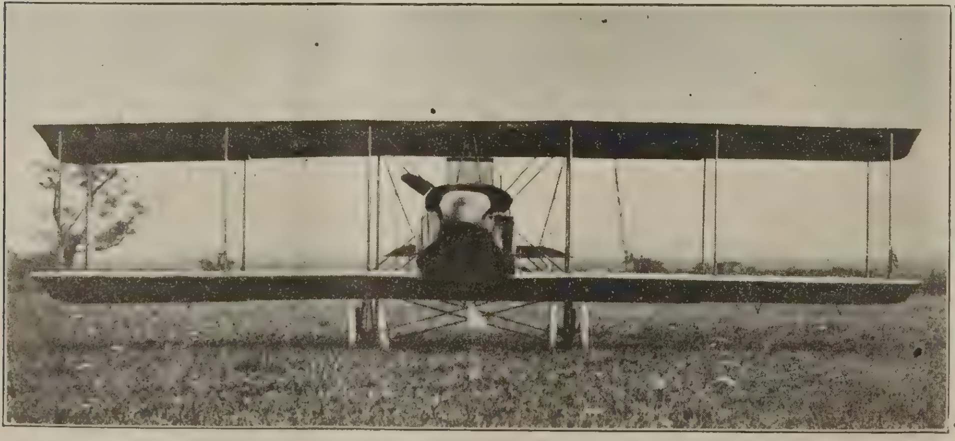
At present the machine is equipped with a Curtiss OX motor rated at 100 h.p., all tests having been conducted with this motor. For use in future machines, the Federal Aircraft & Motor Corporation has been conducting extensive tests with a new motor which they expect to soon place on the market.

CONTROLS.

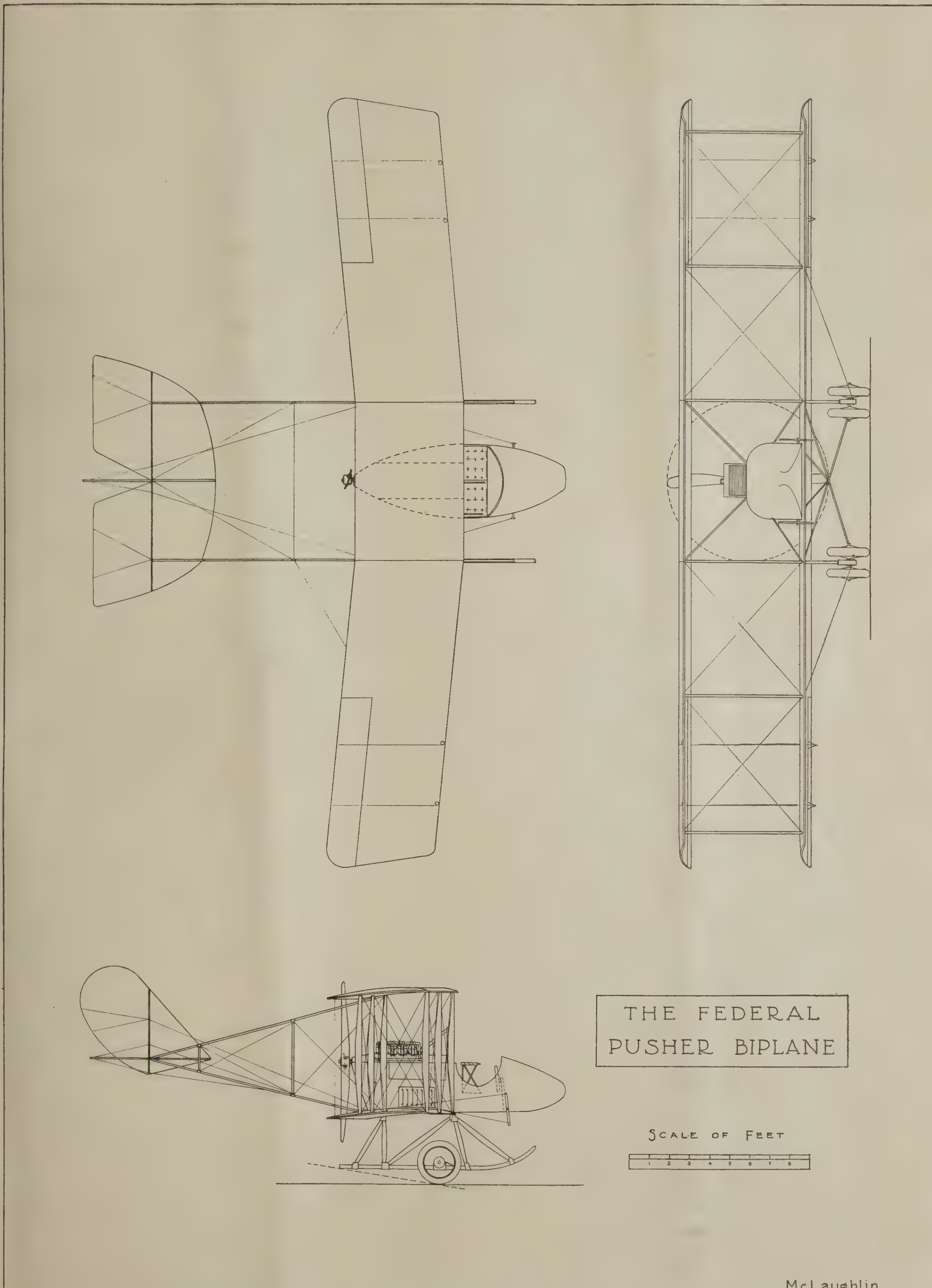
In the machine illustrated, the Curtiss type control has been followed, although this machine has some distinctive features of control. Through a unique chain arrangement, the running of the rudder wire from one control wheel to the other is dispensed with. To change from dual to single control it is necessary only to remove one bolt at the bottom of the steering post, and loosen four nuts which hold the swivel seat. This arrangement of control removal makes it possible to remove any one or all of the controls. In instructing beginners, flights can be made at first without the pupil being bothered with the controls. In later lessons, the rudder control can be installed for the pupil, and so on until the complete control is connected. This dual connection can be installed or removed in five minutes.

LANDING CHASSIS.

The chassis is designed with a wide track, the skids being 8 feet apart. The skid arrangement is of the Farman-Wright type, with two 26 x 4 inch wheels to each skid, sprung on the chassis with Goodyear rubber shock absorbers. The landing gear is constructed to stand a good deal of severe treatment, and tests have shown this gear to maneuver over very rough ground without strain and with perfect control.



Front view of the Federal Armored Pusher Biplane


THE FEDERAL
PUSHER BIPLANE
SCALE OF FEET
McLaughlin

THE CHRISTOFFERSON 120-H.P. AERONAUTICAL MOTOR

THE initial effort of the Christofferson Aircraft Co., of Oakland, California, has been undergoing extensive preliminary tests covering a period of several months. During this time runs of from two to six hours have been made at full throttle, showing a maximum of slightly over 130 h.p. The engineers provided it with overhead valves and camshaft, the excellent characteristics of which are well known.

Horsepower. 120 h.p. at 1,400 revolutions per minute.

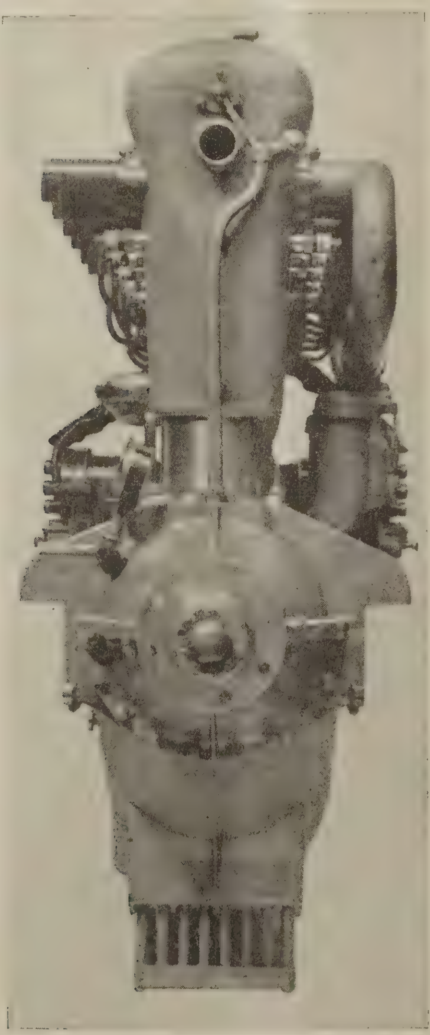
Bore. 4¾ inches.

Stroke. 6 inches.

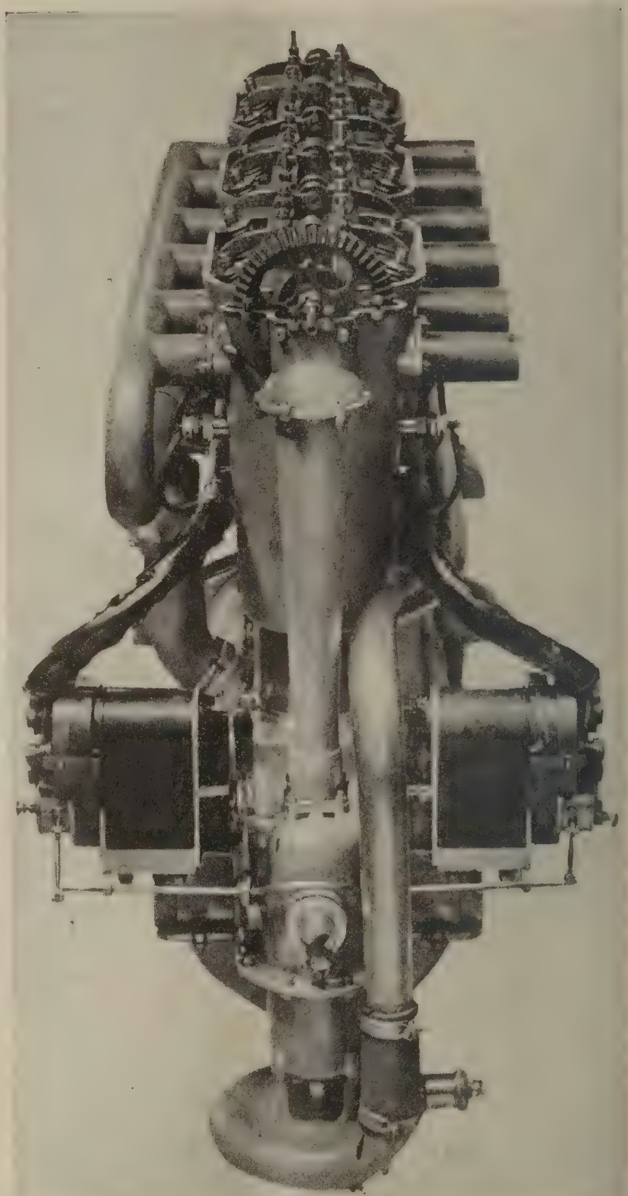
Lubrication. Special effort has been made to do away with oil pipes to eliminate the possibility of pipes breaking from crystallization or vibration. By reference to the illustrations it will be seen that the oil radiator, comprising an aluminum casting, located at the bottom of the crankcase, keeps the oil at a constant temperature, thereby enabling it to retain all of its oiling efficiency. The oil by-pass at the side of the crankcase permits the regulating of oil pressure from 10 to 100 pounds.

Crankshaft. The crankshaft has seven main bearings and one ball bearing, equipped with double row Hess-Bright bearings taking thrust in either direction. The crankshaft bearings are 2⅛ inches in diameter. To adjust the crankshaft thrust bearing it is only necessary to take off the lower small cover (see illustrations) which ordinarily is a continuation of the lower crankcase, but which in this model permits of inspection and adjustment by removing only this end part.

Camshaft. The camshaft is made in three sections, one for each pair of cylinders, and so joined that any cylinder pair may be completely removed without disturbing either of the



The propeller end, showing the small amount of head resistance.



Top view, showing valve mechanism, which is constantly sprayed with oil.

other pairs. At the gear end of the camshaft is a small air pump actuated by an eccentric ball bearing, which supplies air to the gasoline tank for pressure.

Carburetor. A double Miller or Zenith carburetor is used.

Valves. The valves of rich tungsten steel are 2⅜ inches in diameter.

Connecting Rods. I-beam connecting rods are used, made of chrome vanadium steel, and having a tensile strength of 225,000 pounds to the square inch, when heat treated.

Ignition. Two independent Bosch magnetos are used, also two spark plugs in each cylinder.

Pistons. Pistons are made of aloyanum, weighing 1¾ pounds, and having two Burd high compression rings.

Cylinders. The cylinders are made of one-piece steel, with the valve seat right in the head of the steel cylinder. The water jackets are aluminum. The water is in direct contact with the steel cylinder so that the heat does not radiate

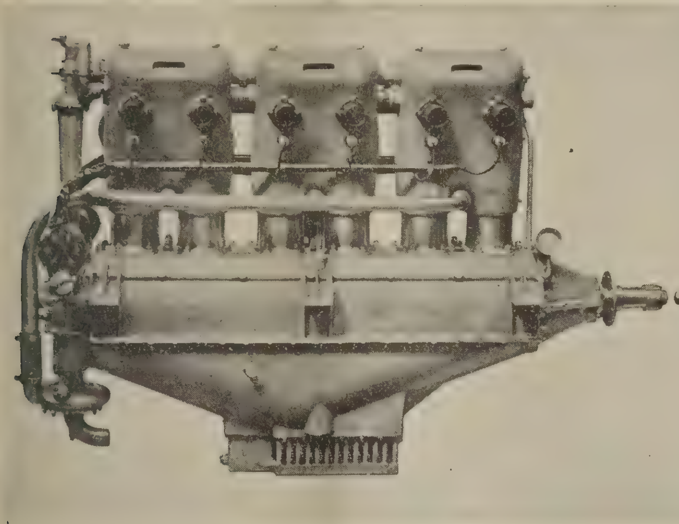
through the steel and then through the aluminum before it gets to the water. Seventy-five per cent. carbon and 3½ per cent nickel steel is used for the cylinder, with a tensile strength of 165,000 pounds per square inch. The cylinder head is oval. The wrist pins are of chrome vanadium steel.

Cooling. Cooling is by centrifugal water pump with a pressure of 220 pounds per minute.

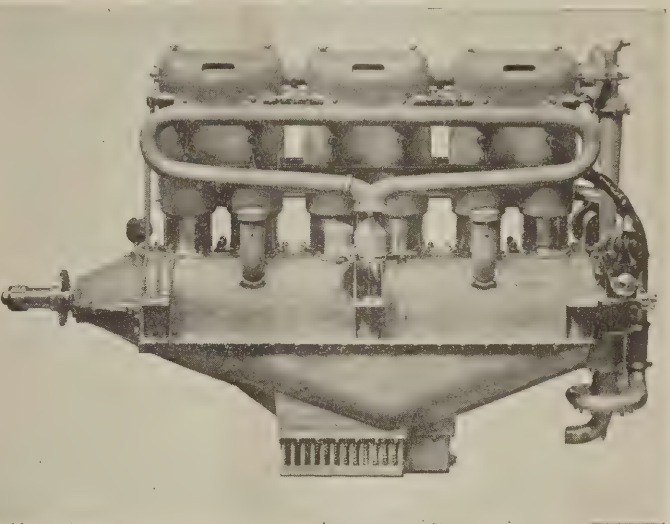
Gears. All gears and shafts are heat treated.

Propeller Flange. The propeller flange of this motor can be detached from the motor very quickly by special nut arrangement that acts as a puller to the propeller flange. This is the only American motor with this feature.

Gear Lubrication. Reference to the illustrations of the oil tube at the end of the motors, the force feed tube and drain tube are combined—the force feed tube being a small tube inside the large one. Oil can also drain from the other end of the motor to the gears and down through the vertical shaft tube back to the crankcase, thereby lubricating all the gears



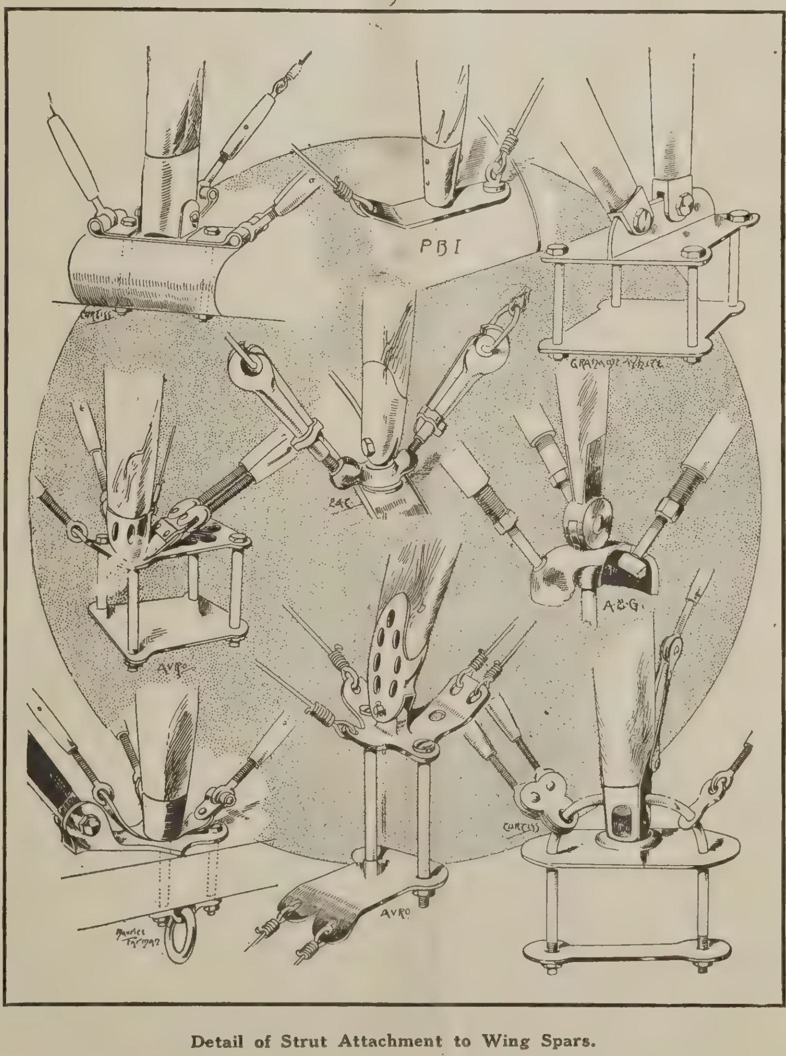
Exhaust Side.



Intake Side.

INTER-PLANE STRUTS ATTACHED TO WING SPARS

IN the accompanying illustration another set of methods by which inter-plane struts are attached to the wing spars are shown. The sketches are so complete in themselves that no explanation is necessary, and the name of the maker employing each of these adaptations is given in connection with the individual illustration.



Detail of Strut Attachment to Wing Spars.

FOREIGN NEWS

AUSTRIA.

A raid on the Austrian city of Trieste by a squadron of seven Italian aeroplanes was reported in the official communication issued at Vienna under the date of April 21. The report follows:

"Seven Italian aeroplanes dropped twenty-five bombs on Trieste yesterday afternoon, killing nine civilians of whom five were children and wounding five other persons. The Salesian Monastery in the chapel of which 400 children were attending divine service was destroyed. By this attack the enemy forfeited every right to have his towns spared."

BULGARIA.

No casualties were caused by the recent aeroplane attack on the outskirts of Sofia, a dispatch from that city says. One school and one house were damaged by the explosion of two large bombs dropped from the aeroplane.

"The flyer at the same time," the message continues, "dropped proclamations in which the capture of Erzerum by the Russians was announced. This caused amusement, inasmuch as Bulgaria is perfectly informed about Erzerum."

FRANCE.

The following is the official report for April 27:

"Yesterday an enemy aeroplane brought down by our auto-cannon fell before Fort Vaux. (The French auto-cannon are light quick-firing guns, mounted on swift motor trucks and capable of firing in a vertical arc, which have proved very effective against aeroplanes and Zeppelins.)

"Last night three of our dirigibles carried out bombing operations, dropping numerous projectiles of large calibre on the stations at Etain and Bensdorf (in Lorraine, about twenty-five miles east of Metz) and the railway at Arnaville. The same night our aeroplanes dropped thirty-seven shells of 120 millimeters (4.7-inch) on different stations in the Valley of the Aire (in the Eastern Argonne, northwest of Verdun); twenty-five shells on bivouacs in the Valley of the Orne (east of Verdun, in the Woevre Plain); six shells and two incendiary bombs on the station at Thionville (in German Lorraine, north of Metz), and eight shells on the Conflans Station." (Conflans is on the Verdun-Metz Railway, close to the frontier.)

The official bulletins of April 30 on the aerial campaign which goes on above the struggle on the western front tell of the shooting down of eight German aeroplanes, among them four Fokkers.

"One of our aeroplanes," says the night bulletin, "attacked two Fokkers above the German lines near Roye. At an altitude of 1,500 meters one, under machine gun fire, crashed to earth; the other was forced to land. Two other Fokkers were brought down by our battle aeroplanes, one near Les Eparges and the other at Douaumont. Five enemy aeroplanes dropped bombs in the region south of Verdun. Our pursuit machines succeeded in bringing down two. A third was brought to earth by the fire of our special guns. An aviatik was forced to earth intact in the Diesne Valley (Orgonne) after a fight with our aviators, who pursued the machine. The two officers who manned it were made prisoners."

The French women are proving very adept in the delicate handling that some phases of aeroplane manufacture require. The warfare now requires a tremendous output of aeroplanes and the manufacturers are helped not a little by the skilled women workers.

During the day of April 27 French aviators delivered numerous aerial attacks. An aeroplane of the enemy was brought down in the region of Fromezey. Two other German machines, attacked by French airmen, were compelled to land seriously injured, one near Douaumont and the other in the wood of Montfaucon. In the region of Nesles-Chaulnes a German Fokker plane, reached by the French fire, was seen to fall head first within the German lines. During the day of the 27th a French air squadron in the Woevre bombarded the railroad station at Lamarche, throwing down eighteen shells.

GERMANY.

The Germans are using at the present time a 104 mm. anti-aircraft Krupp gun, 45 calibres long, which sends a projectile weighing 15½ kilograms, with a muzzle velocity of 800 meters, to a height of 4,000 metres. It can be fired at the rate of 15 rounds per minute. The shrapnel shell which it fires is said to burst into 625 fragments. Guns of this type, as well as those of 120 mm., are the ordnance which defends Ostend.

A new type of Aviatik biplane was recently brought down behind the French lines. Its wings, which no longer sweep back as in the earlier types, measure 41 feet in span, with a chord of 6.4 feet. The engine is a 170-horsepower Mercedes, driving a Garuda tractor. The weight, empty, works out at 1,600 pounds, and the useful load, including armament, amounts to approximately 1,300 pounds. The machine is exceptionally fast and has a climbing speed of 4,000 to 4,500 feet in 15 minutes.

One result of the German raid on the coast of England was the sinking of the Grimbsy trawler King Stephen and the capture of her crew. It was the King Stephen which, on February 2, came on the wrecked Zeppelin L-9, drifting helplessly on the North Sea with a gale coming up. As the crew of the trawler was only eight men, the captain feared to attempt a rescue of the Zeppelin crew consisting of thirty. The captain feared that once the superior number of Germans came on board they could easily overpower his small crew.

The German official report for April 27 contains the following:

"Our aviators conducted extensive bombardments of numerous camps of the enemy. One hostile aeroplane was shot down by our guns near Tahure and was destroyed. Another was shot down east of the Meuse. It rolled over on being struck and fell to the earth. On the eastern front a German aerial squadron made an attack on the railway and ammunition depots at Molodecheno. It had good success, as was noted by the observers."

On April 24 a British aeroplane was put out of commission after an aerial engagement east of Arras. The occupants, consisting of officers, were captured.

The German War Office on April 28 issued the following statement on conditions in the Russian theatre of war:

"The situation is unchanged. Railway establishments and warehouses at Rjezycz were attacked by one of our airmen. Several Russian flying depots were attacked by our flying squadron."

"Three German aeroplanes on April 27 dropped thirty-one bombs on the Russian battleship Slava in the Gulf of Riga. Several hits and a conflagration were distinctly observed.

GREAT BRITAIN.

The official report for April 28 is as follows:

"Yesterday there was much aerial activity, nineteen combats in the air taking place. The machine reported yesterday as having been brought down in our lines was a two-seater. It was attacked by a single-seater three times at a great height. The enemy pilot was shot through the heart and the observer through the body. The machine crashed to earth, with the engine full on, from a height of 14,000 feet."

A simultaneous attack by U-boats, Zeppelins and warships was delivered on April 25 on the coast of Lowestoft, about 100 miles northeast of London. British seaplanes, cruisers and destroyers attacked the German forces and a battle raged in the air, on the sea and under the sea at the same time.

Although the attack was a failure in as much as only a few shots were fired at the British coast, killing four civilians, the German craft made a successful escape. The official statement is as follows:

"During the operations against the German battle cruiser squadron off the east coast this morning two Zeppelins were pursued by naval and land machines over sixty miles out to sea. Bombs and darts were dropped, but apparently without serious effect. An aeroplane and a seaplane attacked the German ships off Lowestoft, dropping heavy bombs. Four German submarines were also attacked by bombs. One seaplane came under heavy fire from the hostile fleet, but the pilot, though seriously wounded, succeeded in bringing his machine safely back to land. It is regretted that one pilot is reported missing. He ascended during the Zeppelin raid earlier in the morning and appears from reports to have attacked a Zeppelin off Lowestoft about 1:05 A. M. He has not been heard from since. About seventy bombs were dropped in the Zeppelin raid on the Norfolk and Suffolk counties. One man is reported seriously wounded from this air attack."

Following one day after the raid of April 25 a fleet of Zeppelins were engaged in a raid on the coast of England. The following is the official English report of the raid:

"Zeppelins were reported over the east coast of Kent between 10 and 11 o'clock Wednesday night. No reports of their penetrating far inland have been received thus far, and as it is misty over east Kent, it is probable that they turned back before midnight. It was reported that one bomb was dropped which fell into the sea."

Only one man is known to have been injured by bombs dropped by the Zeppelins which raided the Norfolk and Suffolk coasts, April 24. The Zeppelins dropped about seventy bombs. Only two of the four or five Zeppelins taking part in the raid attempted to make their way inland, it is officially stated. The British press bureau issued the following statement concerning the raid:

"Last night's raid over the Norfolk and Suffolk coasts appears to have been carried out by four or five Zeppelins, only two of which made serious attempts to penetrate inland. About seventy bombs appear to have been dropped. One man is reported seriously injured. No further details of casualties are now available."

A British aeroplane attacked an enemy seaplane about five miles off Zeebrugge on April 25, killing the pilot. An official statement making this announcement adds: "The machine dropped, the enemy observer falling out while the machine was still at a height of 3,000 feet. The hostile seaplane crashed into the sea and sank."

Further aerial activities are recorded in the same statement. "On the morning of April 23," says the official statement, "in spite of most inclement weather a bombing attack was carried out by our naval aeroplanes upon an enemy aerodrome at Mariakerke. The machines were heavily fired on, but succeeded in returning safely. As far as could be observed, good results were obtained.

ITALY.

In direct contradiction to the Austrian report of April 21 comes a statement from Italian headquarters. The Austrian report said that seven Italian aeroplanes had dropped a number of bombs on the city of Trieste and "by this attack Italy has forfeited every right to have her town spared." Against this contention Italy says:

"Reports forthcoming to the Italian War Office have established the fact that the Italian aviators carefully avoided the city proper."

In regard to the assertion that Italy has forfeited rights, etc., Italy claims that since the outset of the war Austrian aeroplanes have raided unfortified Italian towns.

RUSSIA.

On April 24, enemy aeroplanes threw bombs on Dvinsk. Russian aircraft threw thirteen bombs on the station southeast of Friedrichstadt. On the remainder of the front there was an exchange of fire.

The official communication from general headquarters on April 24 reads:

"His Imperial Majesty, the Commander in Chief of the Army, spent part of the holy week in religious exercises in union with all the members of his staff.

"Enemy aeroplanes threw bombs on Dvinsk. Our aircraft threw thirteen bombs on the station south of Friedrichstadt.

"On the remainder of the front there was only an exchange of fire."

On April 26 the enemy aeroplanes again threw bombs on Dvinsk. South of Krevo the enemy was repulsed and an enemy aeroplane was brought down. Enemy aeroplanes bombarded the station at Gantzevitchi.

TURKEY.

A report issued by the Turkish War Office tells of the complete annihilation of four British squadrons, about 800 men, in a battle on April 23, near Quatia. The report goes on to say:

"On April 25 a British air squadron, composed of nine aeroplanes, in order to avenge the defeat, raided Quatia and dropped about seventy bombs on the hospital, which flew the Geneva flag. One British and two Turkish wounded soldiers were killed, and two British soldiers were again wounded.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Texas Model Aero Club

By Hamer Smith

The Texas Model Aero Club held its first contest at Fort Sam Houston drill grounds on April 23rd. The day and place were ideal, especially the latter, which is of the Texas plain variety and covers about four or five square miles. The distances covered beat all previous club records. The Club average made is better than of last year despite the fact that practically only two members were flying. One member broke his plane in the first flight, the other members were absent because of unexpected engagements.

Those flying were Hamer Smith and Carl Gildemeister, the latter's success being quite remarkable, as he has been constructing models only a very short time. His three flights were all successful and averaged well over 1,000 feet. The greatest distance flight of the day was 2,320 feet, made by Mr. Smith.

The flyers were rendered much valuable support in the form of interest taken by the spectators, among them being many Army officers, whose well wishes seemed to be with the boys. Secretary, 711 Erie avenue, San Antonio, Texas.

Aero Science Club of America

On April 30th the members of the Aero Science Club held their first contest of the National Model Aeroplane Competition with good results, at the Garden City Aviation Field. A large number of members, as well as spectators, were there to witness the flights. Those who represented the Club were Wallace A. Lauder, Curtis Myer, Egbert P. Lott, Frank Broomfield, Rudy Funk and Fred Thiele. Unlike his performance of last year Wallace A. Lauder, the holder of the distance record, was prevented from continuing in the contest on account of an accident that befell his model during the early part of the contest. Mr. Thiele likewise met with misfortune and did not compete. The results of the other contestants are as follows:

	Distance feet
Curtis Myer	2,342
Rudy Funk	1,996
Egbert P. Lott	1,779
Frank Broomfield	1,255

The judges representing the Aero Club of America who officiated at the contest were Messrs. Henry Woodhouse, G. Douglas Wardrop, and Robert R. Bowman. Mr. Edward Durant, director of the Aero Science Club, was also present.

Mr. Louis Fenouillet was kept busy assisting the members of the National Guard Aviation Corp. Mr. Fenouillet, who is also a member of the National Guard Aviation Corp, has made numerous flights with the various aviators of the Guard and, no doubt, will soon qualify to operate a machine.

At the last meeting of the Franklin School Model Aero Club Mr. G. A. Cavanagh was present.

Secretary, 29 West 39th Street, City.

The Funk Tractor

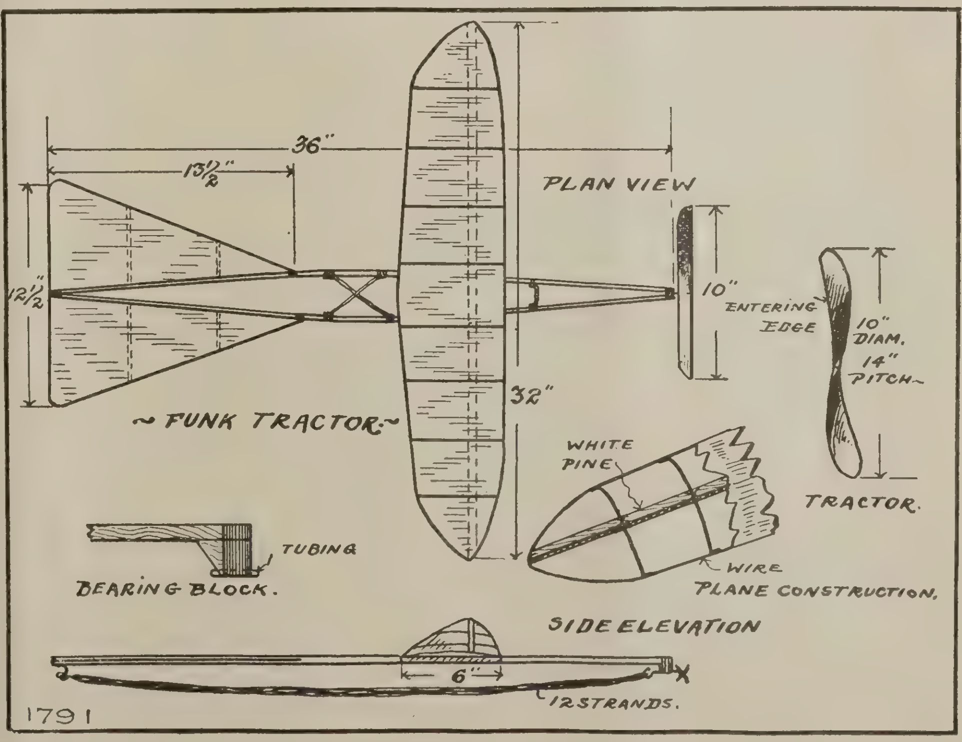
The model shown in the accompanying drawing was one of Mr. Rudolph Funk's first tractor models. Although this model has made but a few small flights, it is well designed and may be of suggestive value to those now engaged in experimenting with tractor models.

The fuselage is constructed of spruce 5/16 by 3/16 of an inch and is 36 inches long. The fuselage is 3 inches wide at the center and is braced by an "X" bracing of bamboo as shown. It is brought together and glued at the front and rear. At the front where the two main beams are joined together, is attached the bearing block and at the rear is a hook for the reception of the rubber motor.

The main plane is 32 inches in span, with a chord at the center of six inches. The edges and ribs of the plane are constructed of 1/16 inch flat steel wire,, and the main beam is of white pine ¼ by ⅛ of an inch in thickness and is rounded off to a stream line form. The sketch shows the construction of the same.

The tail plane is constructed with its edges of wire, and the two ribs are double ribs of bamboo. The planes are covered with silk fibre paper and coated with Ambroid varnish, the main plane being covered on the upper side and the tail double surfaced.

The propeller is carved from a block of white pine and is 10 inches in diameter with a pitch of about 14 inches. The concave edge is the entering edge. It is driven by 12 strands of ⅛-inch flat rubber.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Correlation

"I want a pair of pants for my sick husband," exclaimed the aviator's wife.

"What size?" asked the clerk.

"I don't know, but I think he wears a 14½ collar."

The Strike at the Aeroplane Factory

Pat—I hear you and the boys struck for shorter hours. Did you get 'em?

Mike—Sure. We're not working at all now.

Cloudbursts, Take Notice!

Aviators (desiring to room over night): Is there water in my room?

Hotel Keeper: I guess not. This here hotel's got a new roof.

The Optimist

Aviator: When is a joke not a joke?
Aviatrix: Well?
Aviator: Usually.

Highflying

Mrs. Highflyer: Why, John, are you drunk?
Mr. Highflyer: Well, m' dear, if I'm not I've been cheated.

Uncertain

Gos: Doc Brown over there used to have lots of patients, but I haven't seen anybody going in his office for a week. I wonder where they all are?

Sip: God only knows.

A balloonist was arrested for descending upon private property and upon entering the court room cried in a loud voice: Justice! Justice! I demand justice!

Judge: Silence! The defendant will please remember that he is in a court room.

The Crusoe of the Future Shipwrecked on a deserted Asteroid

Different Standards

It is odd that a Zeppelin or an aeroplane can drop a bomb on a fisherman and sink him, all hands drowned, without resulting remonstrance, but a submarine that does a similar trick incurs immense reprobation.

What is outrageous in a fish seems negligible in a bird. But why?

Overheard on the Aviation Field

Tommy—Oh, mother, look at that man! He's only got one arm.

Mother—Hush! He'll hear you.

Tommy—Why, doesn't he know it?—*Tiger.*

"What on earth are two Zepps on a cloud?" she asked. "That's the order I've just taken from the last soldier to come in, and I won't tell him to translate." Whereupon she proudly served him with two sausages and a poached egg.—*Weekly Dispatch.*

Two aviators in an art gallery—Thash a fine pisher, ain't it, John?

Yep, the trees wave so nasheral.

Good News

The Aeronaut (to his wife): The French have gained four hundred meters from the enemy.

Wife: How splendid; That should help to put a stop to those dreadful gas-attacks!—*Tit-Bits.*

In the days of wireless telephony:

Central No. 1—This party wants to speak to Mr. Smith, Mgr., Aerial Platform at Timballs.

Central No. 2—Line's busy; tell him to hold the air a minute.—*Pitt. Panther.*

Judging from the Specimen

Jim: An aviator reminds me of a spider.
Jam: How so?
Jim: Lives by flies.

"What will you charge me for the use of an arrobus for a few hours?"

"It will cost you $2 for the first hour and $1 for each additional hour."

"Well, I'll use it for two additional hours. I've got some shopping to do and will not require it for the first hour."—*New York Sun.*

Food for Thought

First Aviator (returning from abroad on rather rough trip): Ah, isn't the salt air bracing. The sea is good for a man!

Second Aviator (wanly): Yes, it certainly calls forth the best that is in you.

Misunderstood

The mechanic had returned to his native village after an absence of some years and was inquiring about his old friends and acquaintances.

"And where's old Cooke?" was one question.

"Dead."

"Dead?"

"Dead!'

"Well, peace to his ashes."

"Oh," said the informant, "do you think he's gone there?"

First Pilot—Why did you send for Dr. Randall to treat me? He's an old ass.

Second Pilot (a friend in need)—Well, you know the principle, old fellow—like cures like.

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VOL. III — NEW YORK, MAY 15, 1916 — No. 9

A Roosevelt Administration in 1907 Gave the United States Army the First Aeroplane Ever Used for Military Purposes—Another Roosevelt Administration Seems to Be the Only Hope to Give the U. S. Army and Navy Their Much Needed Air Service

A Roosevelt Administration, in 1907, at a time when aeroplanes were not yet publicly known to be capable of flight, with remarkable foresight and progressiveness, drew the specifications for an aeroplane, and gave the United States Army an aeroplane—two years before any other country took a similar step.

One who looks for a solution to the problem of organizing the air service needed for national defense finds that the only hope lies in another Roosevelt Administration.

Last Hope of Getting Action from Wilson Administration Fading

The last hope of getting action from the Wilson Administration is fading as the Administration persists in misrepresenting the needs of the Army and Navy so as to avoid, for political expediency, having to collect the revenues necessary to pay the bills for adequately equipping the Army and Navy.

Unfortunately, the Democratic leaders in the House are also weak politicians, who are unable to cope with the situation. Their favorite expression, when they are brought to face their responsibility for inaction is:

"We are giving all that the President has asked for."

Congress Says Administration Is To Blame

Unable to see the forest for the trees, these weak politicians are in a chaotic state of mind, which prevents them from seeing things from a national viewpoint and following public opinion. It required from five to six hundred editorials in the press throughout the United States, including some severe criticism from strictly party papers, to make Democratic leaders in Congress realize that they were being held responsible for the pitiful conditions of the U. S. Army Aero Corps which participated in the Mexican campaign, these conditions having been caused by their failure to provide the means for organizing and equipping this important arm. Finally the criticisms grew so severe that, the *Congressional Record* shows, members of Congress complained on the floor of the House that "There is entirely too much criticism of Congress throughout the country."

The discussion that followed fills two pages of the *Congressional Record,* and, unfortunately, lack of space precludes our reprinting it in its entirety. The substance of it is that Congressmen Hay and Fitzgerald dodged the responsibility by stating that Congress had given the Army "all that was asked," thus placing the responsibility for slashing the Army experts' estimates up to the Administration.

House Naval Committee, "Giving All the Administration Has Asked For," Would Make U. S. Navy Rank Twelfth!

On May 1 the House Committee on Naval Affairs refused by a vote of 9 to 10 to increase the appropriation for naval aeronautics from $2,000,000, the sum asked for by Secretary Daniels, to $5,000,000 or $7,000,000, which represents the minimum sum recommended by the Navy experts. No excuse is given for this action. The Committee declines to assume any responsibility, and states that it is "giving all that the Administration has asked for."

With only $2,000,000 the U. S. Navy, our first line of defense, is scheduled, from the standpoint of aeronautics, to rank twelfth, that is, behind England, Germany, France, Russia, Austria, Italy, Turkey, Bulgaria, Spain, Portugal and the Netherlands!

Secretary Baker's Plan to Make U. S. Army Rank Thirteenth!

Secretary Baker has asked for only $1,000,000 for the entire Signal Corps, including Army aeronautics. Not more than half of this sum would be for aeronautics—and that is just about one-tenth of what is needed to make our Army rank twelfth, behind England, Germany, France, Russia, Italy, Austria, Turkey, Bulgaria, Japan, Spain, Switzerland and the Netherlands. Therefore, the United States Army is scheduled to remain back of all these countries, with their colonies.

Again, Congressmen and Senators state that they cannot go above the estimates without assuming greater responsibility than most of them individually care to assume, and they are frank in stating that that is the reason they did not give more for aeronautics last year. The Administration, to dodge the responsibility of raising the funds needed to properly equip the Army and Navy, decided to allow the Army and Navy only the same amount as had been allowed in 1914—before the war demonstrated the need of national defense to protect our national integrity.

Navy's Exercises at Guantanamo Reveal Pitiful Conditions

We have seen the results of this injudicious disregard of the most important of national needs. The Mexican trouble and the naval exercises at Guantanamo in the past two months have revealed the pitiful conditions of aeronautics in the Army and Navy. They revealed the fact that neither the Army nor the Navy had as yet taken the first step towards organizing an air service.

The official records show that the daily average of aero-

planes in commission in the Army during the past twelve months was seven machines. The Navy was not better off.

The Mexican expedition brought out the shocking conditions of the Army Aero Corps and the public and press have expressed their disgust in no uncertain terms. But the truth about the Navy is not yet known—and Secretary Daniels has been juggling with the truth to make it appear that conditions are better than they actually are, and has gagged the experts, so they cannot tell.

Some of Secretary Daniels' Misstatements

Here is Secretary Daniels' last statement regarding the conditions of the air service, which contains no more truth than his statements regarding the alleged record cruise of submarines:

"Our present air fleet is not more than two years old. Upon my recommendation Congress gave us $1,000,000 *to begin upon an elaborate plan the real development of aviation in the Navy. At that time the Navy had but four aviators and no satisfactory machine. A special training school has been established at Pensacola, Fla., and we have about forty machines now in operation down there. The armored cruiser North Carolina has been equipped successfully as a mother ship for aeroplanes and participated in the recent exercises at Guantanamo. The same sort of equipment is being extended to the armored cruisers Washington and West Virginia."*

Let us go over this statement point by point to see just how far Mr. Daniels juggles with the truth.

We have not yet an air fleet. The first step towards organizing an air service was taken in 1911 under the Taft Administration, and the one advance to which Secretary Daniels points with some pride, the launching device for aeroplanes, was developed and tested before Mr. Daniels became Secretary of the Navy. If two years later there were only four aviators in the Navy, it was due to Mr. Daniels' neglect of aeronautics. He could have done as Lord Churchill did when he became head of the British Navy and found that there were only a few aviators. He added over one hundred in one year. Unlike Lord Churchill, Mr. Daniels paid no attention to aeronautics, and two years later he still knew so little about the subject that when the House Naval Committee in 1915 proposed to allow $1,000,000 for aeronautics he told the committee that he would not know what to do with it. The fact that the General Board of the Navy had recommended an appropriation of $5,000,000 and the plans were all ready for organizing the air service did not count with Mr. Daniels. His attitude was like the attitude of Congressman J. J. Fitzgerald, who, when asked, during a debate on the floor of the House, whether he did not know that the General Board of the Navy had recommended the appropriation of $5,000,000 for aeronautics, replied: *"I did, and that is the reason I pay so little attention to their recommendations."*

Only an aviation school was established at Pensacola, instead of four schools, as the Navy needed, and there never have been even fifteen aeroplanes in commission there at one time. Therefore, it is not true that "we have about forty machines now in operation down there," as Mr. Daniels states.

Likewise, the armored cruiser *North Carolina* did not go down to Guantanamo equipped as a mother ship for aeroplanes. It went there with nine aviators and only four aeroplanes, no launching device, no radio for aeroplanes, no bomb-dropping device. Being extremely short of personnel to man the ship, the aviators had to do ship duty, and that left little time for the aviation exercises. An enterprising officer "rigged up" a radio set, but it was insufficient to meet the need, so the fleet could not employ aeroplanes to spot the fall of shots during gun fire practice. The lack of radio sets also prevented the working out of difficult naval problems, such as directing the movements of the fleet by advising it of the movements of the enemy's ships.

Theodore Roosevelt

During whose administration the U. S. Army was supreme in aviation

National Safety Sacrificed for Political Expediency

With such shocking conditions existing in the Navy, Secretary Daniels dares to tell the country that the Navy is "prepared" and actually opposes further developments! With worse conditions existing in the Army—conditions so bad that Mexican bandits carry on raids on American soil, killing American people and destroying American property with impunity and derision—the new Secretary of War, disregarding the advice of the military experts, who have asked for an appropriation large enough to organize eighteen aero corps, asks Congress to appropriate barely enough to get two aero corps! And Congress is actually planning to pass political measures which pretend to increase the Army and Navy, but will not do so, because there will not be allowed the funds necessary to carry them into effect.

When Villa's first raid took place, a growing number of disgusted Americans said, "Serves us right. A beating now will wake us up. We'll build up our Army and Navy after this and save ourselves a worse beating later!"

We have gotten our "licking." Our entire Army cannot prevent the raids of Mexican bandits. But we are *not* waking up; we are *not* building up our Army and Navy; we are *not* taking steps to "Save ourselves a worse beating later." National safety is being sacrificed for political expediency.

On Day Following Mexican Raid Proposition to Make U. S. Army Rank 15th is Voted Down Because it Would Cost 1/3 of 1 Per Cent of Our National Wealth.

On the day following the most recent Mexican raid on American soil, Congressman Hay led the fight against, and succeeded in defeating the Senate plan to increase the Army to 250,000 men. The arguments used by Congressman Hay are identical with the arguments advanced by the Administration eight months ago to those who criticised the Administration for suppressing the recommendations of the General Board of the Navy and the General Staff of the Army and issuing in their place programs which did not provide for what the safety of the country demanded. The Administration's answer then was, as Hay's answer is now: "It would cost half a billion dollars to carry out the experts' program."

Politicians who speak of a "Huge army of 250,000 men," and the "Enormous expenditure of half billion dollars" are, to use a common expression, "talking to the galleries." But the "galleries," the common people, can no longer be fooled with such nonsense. The percentage of common people who pay insurance and have adopted efficient methods of doing business has increased tremendously and the policy of insuring one's self in proportion to the risks and to the value of objects insured prevails everywhere.

Army and Navy expenditures are being considered more and more as national insurance and the amount to be spent

is expected to be proportionate with the risks and the value of what there is to lose.

The present war and the Mexican trouble have shown the need of military protection. Our national wealth amounts to close to $188,000,000,000—not counting the undeveloped resources, which probably amount to hundreds of billions more.

To spend even $1,000,000,000 in protecting this wealth would mean spending about half of one per cent of the national wealth—spending it in this country, in developing American resources, in salaries to American labor, for the protection of American interests.

It is well for us to consider that the United States is the wealthiest nation in the world by about one hundred billions. Our wealth compares with other countries as follows:

United States	$188,000,000,000
England	85,000,000,000
Germany	80,000,000,000
France	50,000,000,000
Russia	40,000,000,000
Austria	25,000,000,000
Italy	20,000,000,000
Japan	15,000,000,000

American Commerce at Mercy of Other Countries

If two months after Villa's raid on Columbus, our entire American Army was not able to prevent another raid, nor to cope with the Mexican situation—who but a fool can believe that we could cope with a well equipped army such as would be sent to invade this country or an efficient navy such as would be employed to destroy American commerce?

Ten foreign powers had armies of from 500,000 to 5,500,000 before the war—which have now increased to tremendous proportions, so that should the war stop within a year they would still have well trained and well equipped armies much larger than what they had before the war—and therefore would be in a position to invade this country and get some of the wealth which they sorely need.

The nations which today form the monstrous war machine which is threatening the world, had, at the outbreak of the war, armies of the following war strength: Germany, 5,500,000; Russia, 5,400,000; France, 5,300,000; Italy, 3,380,000; Great Britain and Colonies, about 2,000,000; Turkey, 1,928,000. Even the smaller countries, most of which are not as large as any one of our small States, had armies many times larger than the United States Army. Belgium had an army of 350,000; Bulgaria of 450,000, and Serbia of 500,000. Thus, Belgium, with 350,000 well equipped and trained soldiers, and Serbia, with 500,000 soldiers, have been practically wiped out.

After considering this one surely cannot hold that it is excessive to demand that Congress provide as soon as possible, a Navy equal to the best; a standing Army of between 250,000 and 500,000 and a well equipped and well trained militia or a volunteer army, or both, to insure a substantial reserve.

We Were Proud of Being Americans Then—Are We Now?

The ship of State needs a crew of strong men with an able, tested captain. The present unmanly, shifting and dodging of responsibility is disgusting and leads to national disaster.

What a far call from that broad, progressive Administration which assumed responsibilities instead of dodging them, had foresight and patriotism—that Roosevelt Administration which gave to the U. S. Army its first aeroplane! We were proud of being Americans then, are we now?

SHEEPSHEAD AVIATION MEET SANCTIONED BY AERO CLUB

SANCTION for the aviation meet to be held at the Sheepshead Bay Speedway on May 20th-28th, in connection with the Military Tournament, was granted by the Aero Club of America today.

Bank guarantee was given by the Fifth Avenue Bank for Harry S. Harkness for $10,000, to be divided into prizes. Mr. George P. Dillenback, Manager of the Tournament, stated that he expected to add a number of valuable trophies and $5,000.

Program for Aviation Events for May 20th-28th

First Day

Cross-Country Rally, aviators flying to New York from other cities, arriving during the day. Aviators coming from greatest distance to receive prizes, as follows:

1st Prize	$1,000
2nd Prize	750
3rd Prize	500

Second Day

Military Demonstration in connection with the mobilization of the Militia. The aviation event on this day will be as follows:

There is a skirmish between an aeroplane which is trying to drop bombs over a building and an armored car which shoots at the aeroplane with an anti-aircraft gun. The gas tank of the aeroplane is hit and the aviator lands hastily. Another aeroplane of the same squadron promptly lands with the intention of picking up the aviator from the damaged plane. At that moment several armored cars try to come over to seize the aviators, who promptly turn the aeroplane guns on the attacking forces. These are about to get the best of the situation, when several other aeroplanes drop bombs on them, and they dash away to get assistance. While they are gone, two other aeroplanes land, and the pilots try to help the pilot of the crippled aeroplane to repair the damage. Finding this impossible, they all fly off, leaving the crippled aeroplane behind—to the disappointment of the anti-aircraft squad, which returns just in time to see them get away and fires at them, but without effect.

The four pilots participating in this event will be paid $250 each.

Third Day

Competition for altitude, not less than 7,500 feet, and bomb dropping. Prizes for altitude: 1st, $500; 2nd, $250—to be doubled if an American or world record is broken. Prizes for bomb dropping contest: 1st, $250; 2nd, $150.

Fourth Day

Race to Newark and back. Prizes of $1,000, $500, and $250 to go to the three aviators making best time.

Fifth Day

Attack on an artillery observer's balloon by two or more aeroplanes. The balloon, stationed on the field, will have Rodman Law as observer, who is supposed to observe the fall of shots and direct the batteries by advising the men behind the guns by telephone of the effect of artillery fire. The enemy airmen fly over the balloon and drop bombs upon it. One of the bombs hits the gas bag, which explodes. Rodman Law drops to the ground with a parachute, reaching the ground unhurt.

Pilots and Mr. Law will be paid $250 each for this event.

Sixth Day

Best time made in flying ten laps around the Speedway two-mile track. Prizes: 1st, $500; 2nd, $300; 3rd, $200.

Seventh Day

Competition for altitude and bomb dropping, same as third day; $1,150 in prizes.

Eighth Day

Military Demonstration same as second day. The events for the trophies and additional $5,000 will be announced later.

If Notes Were Matériel and Personnel

HAD there been a unit of our Navy ordered for every note delivered, and an aeroplane acquired and a man enlisted for every sentence and word contained in each note, we would be sufficiently protected and would not be so harassed by trouble-seeking people.

The News of the Week

Wright Company Leases Hempstead Plains

The Wright Aeroplane Company has leased the Hempstead Plains aviation field and its equipment of twenty hangars for five years. The establishment of the new flying school in this vicinity will mark a new era in local aviation. The Wright company plans to keep at least a dozen high-class machines on hand all the time, and hopes to have a large corps of enthusiasts learning to fly. At present the school at Augusta has about five machines in commission and a fairly large group of beginners.

The school machines of varying types are being packed up ready for shipment to Garden City, L. I. It is expected that the new school will open on May 15.

Many of the aviators and aeroplane companies which occupy hangars at the Hempstead field will have to find other quarters. There are about twenty hangars on the field. Most of them are occupied.

Among the concerns which now are there are the aviation detachment of the National Guard, the General Aeronautic Company—successors to the Heinrich Company and not to be confused with the new Wright company of same name—the New Jersey Aeroplane Company, the Empire State Aircraft Corporation, Sidney F. Beckwith, sportsman-aviator; the Ilvane Manufacturing Company, the M. F. P. Corporation, L. G. Young and the Interstate Aircraft Company.

Most of these will have to move out at the end of this month. Until their hangars are vacated the Wright school will use the few hangars that already are vacant or not in use. It is not likely, however, that all of the companies or individuals now at the field will have to get out.

Officials of the new company say they are willing to listen to renewed leases on the part of a few of the companies or individuals whom they think are best suited to stay. It is understood that there is little danger of the National Guardsmen having to move.

Three World's Records in One Day

World's records for altitude, speed and duration were broken on April 30th, at the Atlantic Coast Aeronautical Station, Newport News, Va. All records were made with Curtiss aeroplanes and Curtiss motors.

Pilot Victor Carlstrom, flying the new twin-motored tractor aeroplane of the Model J-N type, climbed 16,500 feet in 1 hour and 30 minutes, carrying a passenger. The machine used is a new type of military aeroplane, equipped with two Model OX-2 Curtiss motors of 90 horsepower each. The pilot and observer are located in a nacelle type of fuselage, giving a wide and unobstructed range of vision. The flight established a new world's record for altitude and rate of climb with passenger. The machine showed a speed of 100 miles per hour and climbed well on one motor.

The second and third records were made by Pilot T. C. Macauley with the Model H-10 Curtiss flying boat equipped with two model VX 160 h.p. Curtiss motors. Macauley carried six passengers in addition to himself and remained in the air one hour and ten minutes, climbing 1,000 feet and making a speed of 88 miles per hour. The previous world's records for duration and speed with pilot and six passengers were held by M. Garaix, of France, who made a speed of 67.2 miles per hour and remained in the air one hour and two minutes.

178 Miles with Five Passengers

Establishing a new record for distance covered and duration of flight by five-passenger hydroaeroplanes, "Tom" Macauley piloted the fifteen-ton Curtiss flying boat through the air from Newport News to Baltimore on April 6th.

The start from Newport News was made at eight minutes to eight o'clock. The machine with its five occupants alighted in the Patapsco River, below Fort McHenry, at five minutes to eleven o'clock. It had covered 178 miles without a stop.

The hydroaeroplane was towed to the Fort, where there was a small crowd awaiting it, the time of its coming having been in doubt.

The machine started back for the Atlantic coast aeronautic station at Newport News in the afternoon. The trip to Baltimore was not clear sailing. Macauley reported adverse wind, but said at no time was there serious trouble, and the machine behaved handsomely under trying conditions all the way. He laid his route over the bay.

When the machine passed over Fort Carroll the pilot prepared to descend to the surface of the water, not knowing the exact location of Fort Henry.

With the enthusiasm of a young boy, Macauley told of the flight he and his crew had with a young cyclone that struck his craft off the mouth of the Patuxent River, how the wind buffeted them about as a feather in a gale, and how finally they battled their way through the treacherous air currents into a placid lane.

Phillies' Pitcher an Enthusiast

Grover Cleveland Alexander, the Phillies' star pitcher and the premier boxman of the National league, made his first ascension in an aeroplane with Johnny Green, the aviator who made the trip across Lookout Mountain in Tennessee. Manager Moran was very reluctant about letting Alexander make the trip, he does not want his $40,000 star to get the habit of making these aerial ascensions nor does he want to run the risk of Alexander's getting hurt.

Miss Katherine Stinson and "Tex" Millman who flew at the Sheepshead Bay Motordrome on Saturday of last week.

The Sheepshead Bay Aviation Meet

Twisting, spiraling, now upside down in a breathless loop, now hurtling downward for a thousand feet of sheer drop that seemed certain suicide, only to bring up in a graceful volplane to her landing place on the infield—that was Miss Katherine Stinson last Saturday afternoon at the Sheepshead Bay Speedway aviation tournament. The announcer, bellowing through a huge megaphone, called her the "Queen of the Air," but she was more than that. She was like a part of the firmament itself, miraculously made visible and playing vagrantly in her native element.

The thrills the twenty-year-old aviatrice produced not only had the laiety in the grand stand spellbound, but they astonished even veteran fliers of the other sex, of whom there were many present. It takes weight and muscle to hold a heavy biplane steady on its course through a diving loop, but this frail, almost childish appearing girl duplicated the feats of the best of them and did it with seeming ease.

The tournament was scheduled to begin at 3 o'clock, but it was an hour later when, after several short trial flights, the first event was announced. It was a race between Tex Millman, who carried a motion picture actress over New York last Thursday, and Dario Resta, the automobile speedster.

Millman, although he lost the contest by the narrowest of margins, gave a perfect demonstration of his control over his machine. The course was two miles around the speedway track and throughout the race Millman flew not more than thirty feet above the ground, a far more dangerous height than a hundred times that altitude would have been. He never wavered, even when the nasty winds eddying about the grand stand caught him from one side, but traveled on as though running a solid path.

Then Miss Stinson started out. Up she went to a height of about 1,500 feet until the roar of her engine was barely audible. Then she seemed to poise an instant, swooped, turned upward and over in a clean loop, while two trains of smoke from magnesium flares on the rear of her biplane marked her path. She hesitated once, twice, and then came the same clean dive and somersault, while a hundred automobiles parked in the field honked applause and drowned out the hand-clappings of the crowd.

The end was even more thrilling, for from a height of about 1,000 feet she turned downward and dropped like a plumpet to within 100 feet of the ground until it seemed that she never could straighten out in time, only to curve to a level and alight easily.

Dario Resta, apparently anxious to show what his powerful Peugeot could do without the unnatural competition from above, then raced the two-mile course against time, finishing in 1 minute 6 seconds, at an average speed of 109 miles an hour. J. C. Vincent, vice-president of the Packard Automobile Company, had brought out a gray car to demonstrate it. He, too, went around the course, but failed to beat Resta's time, making 108 miles an hour.

The next event had a military flavor, for Miss Stinson bombarded a skeleton fort in the infield. As she shot past the grand stand she dropped eight cylinders, each containing a small charge of dynamite, which exploded in the air with a bang. From the fort, to continue the illusion, a small mortar shot up bombs at her aeroplane, which burst in tiny white clouds as she went by.

Then came a race between the girl flier and Resta. The automobilist failed to duplicate his former victory, for Miss Stinson's machine was faster than Millman's, and she won easily.

Bion J. Arnold on Consulting Board

Mr. Daniels, Secretary of the Navy, has requested Bion J. Arnold, of the American Society of Aeronautic Engineers, to accept the post of representative of that society on the Naval Consulting Board, the institution organized by Mr. Daniels to promote the application of civilian inventive genuis to naval preparedness. Mr. Arnold succeeds Henry A. Wise Wood, of the Aeronautic Society, a bitter critic of Secretary Daniels and of the Wilson administration, on the score of the inadequacy of its preparedness programme.

Mr. Arnold has taken degrees of electrical engineer, doctor of science and doctor of engineering. He has had wide experience in engineering work, especially electrical, and is an inventor of national reputation.

His interest in aeronautics has been purely non-commercial, and began as far back as 1889. He was a member of the Committee on Aeronautics at the World's Columbian Exposition, Chicago, 1893. He had followed with interest the work of the Wright brothers, gave the prize for the international balloon race in Chicago in 1908, is a member of the Aero Club of America, and was president of the Aero Club of Illinois for the years 1912-13.

Thomas Tractor Climbs Rapidly

The type T2 Military Tractor Biplane, which is equipped with a model OX2 Curtiss motor and which was purchased by the National Guard of the State of New York, made a new class record in the demonstration tests at the Hempstead Aviation Field. In the acceptance trials, a speed of 93 m.p.h. with and against the wind was made. This was officially timed by officers of the National Guard. With pilot, passenger and two hours gasoline, the machine climbed 2,500 feet in the remarkable time of four minutes twenty-five seconds.

For every machine purchased, the Thomas Company will train an aviator at Ithaca, N. Y. Access to the factory during the period of training will also be of considerable importance to the student. The instructors are licensed pilots and instruction will be given on modern high-powered machines.

Group of Curtiss School Students at Newport News. Captain Baldwin Wm. Bouldin, Captain McMillen, Captain Taylor, Lieutenants Cummings, Honer, Coyle Wehrle, Romburger, Bagnell, Byrd, Johnson, McDaniel, Smith, Hickman, Moore, Ward, Osborne, Sheldon, Aviators McCauley, Pond, Bonney. M. Goodenow, C. Probst, M. Birdsell, A. Geegebhoy, A. Brymer, H. Rimmer, C. Boswell.

Export of Aeroplanes

Exports of aeroplanes and parts during the week of May 1st were: To England, $98,910; to Cuba, $290; total, $99,200.

Polson Ironworks Activity

The battleplane of the M. F. P. Aeroplane Co., of Toronto, affiliated with the Polson Iron Works, will shortly be in service in the vicinity of New York. This company has also under construction a twin-float seaplane, of streamline form with tapered nose, which will be equipped with a Hall-Scott motor.

Garden City Activities

The past week has been one of much interest to those connected with the Aerodrome. During this time the 1st Aero Company have put in some remarkable work with their new machines; the control of the field itself has been acquired by one of the large firms engaged in the construction of aeroplanes; some new aviators and machines have appeared; and two smashes have occurred.

The record book of the 1st Aero Company, N. G. N. Y., shows that nearly as many student-flights took place from May 1 to 7 as were taken during the months of November, December, January and February combined. Some of the men who came to the field were unable to get in any flights, although through no fault of either machines or instructors, as both have been ready whenever the flying has been good. This shows the right spirit on the part of the members of the company, as every minute secured in the air by any member makes for the efficiency of the company as a whole.

Are you a "Roughneck," a "Lily Finger," or a plain "Low Brow"?

A new Sloane tractor arrived on the field Wednesday. It is on the same general model as the previous Sloane, but has several refinements; the most noticeable of which are the cleaner cut radiators, a flatter wing section, and a slight tapering of the fuselage. Mr. Day, the designer of these machines, has good reason to be proud of his work, and of the general performance of the big "battleplane."

That the men might have quarters so located as to be immediately adjacent to the field, the 1st Aero Company, N. G. N. Y., have secured the small building on the very edge of the field itself, midway between the lower concrete hangars and those to the north now occupied by the four machines of the company, and are remodeling it to suit their requirements, the work being done by members of the company themselves. The building is divided into two good-sized rooms, the front, and larger, being attractively paneled in mission over red background with exposed mission beams, nicely carpeted, and at present containing cots, wardrobes, tables, chairs and bookcase. The rear room is fitted as a kitchen, having a large range, cupboards, etc., it being the plan to have a cook at the field continually in the near future.

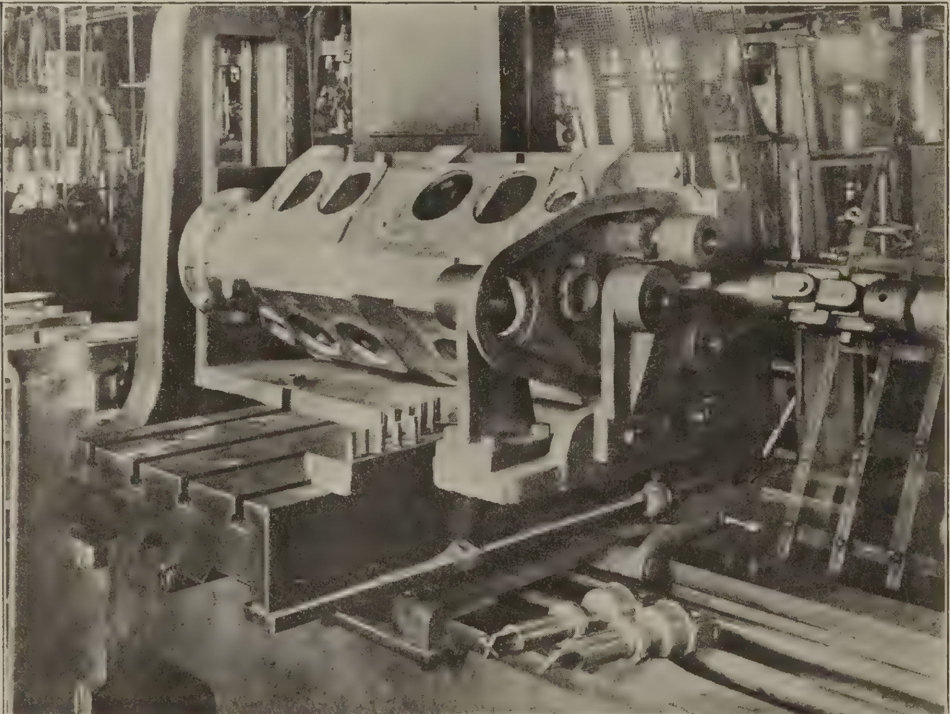
Have you ever noticed that the chap that "bump you three" is usually the one who has to sleep on the tables? Poetic justice!

The accident of Thursday, May 4, is to be deeply regretted, but it is one of those occurrences which will aid rather than hinder the progress of the game. Howard Blakely and De Loyd Thompson were taking up the big 125 h.p. Sloane machine, recently acquired by the 1st Aero Company, N. G. N. Y., for the purpose of giving Mr. Thompson some practice on the "Dep." control. It seems that Mr. Blakely, after clearing the ground, released the controls to Mr. Thompson as had been previously arranged. Mr. Thompson has been accustomed to the old "Wright" control, and a somewhat lighter machine than the big ton and a half Sloane, and appears to have banked her too steeply for a turn while still climbing about 200 ft. up. Mr. Blakely, knowing Mr. Thompson's usual ability, hesitated to take control of the machine until he saw from the air-speed indicator that the machine was stalling, and by the time he was able to get it nosed down, it had gotten into a tail spin, which the slow speed of the machine and the proximity of the ground made it impossible to get out of. The big plane hit on the front of the right wing and swung over onto the left. It was due to the fact that the greater part of the shock was taken up by the crushing of the wing, and the heavy landing gear, that Messrs. Blakely and Thompson owe their lives. As it is, Mr. Thompson's ankle is broken in two places and badly dislocated, while Mr. Blakely's face is mashed and his back severely wrenched. The machine itself is a complete wreck, and it would be very impractical to attempt to repair it.

Several points were brought out by this accident, the chief of which is the real danger of two experienced men going up together and both attempting to control the machine. It is always a mighty risky stunt and the danger is doubled when the pilots are accustomed to different systems of control. The hardest pupil in the world to teach is the man who already knows one "control." His mind works instinctively to his original system, and, as that veteran in aviation, Captain Thomas Baldwin, put it: "I would rather take a man from between the plow handles any time and train him, than to take the most experienced pilot in the country and teach him a different 'control.'"

The value of the speed indicator was also clearly demonstrated, as well as the advantage of taking pupils to at least a 2,500 feet elevation before giving them control of the machine. At this height the pilot can extricate the machine from any difficulty the pupil may get it into.

Tex Millman destroyed New York on Thursday last with "bombs." His missiles were made of cotton batting, and contained passes to the "movie show," and were "fired" from the hands of pretty Miss Pearce, the youthful movie maiden. Tex also took De Loyd Thompson's place at the races at Sheepshead Bay on May 6, flying with Miss Katherine Stinson.



A Thomas 135 H. P. Aeromotor crankcase in specially designed "V" blocks locate the casting with respect to the most important points. The bearing caps are bolted in place and it is adjusted in the elaborate boring fixture shown being located by the dovetail into which the bearing caps fit. Boring bars, which are supported at each bearing by hardened and ground steel bushings are then used with proper cutters to bore the crankshaft and camshaft tunnels. Two roughing and one finishing cuts are taken through all holes and operator is provided with limit gauges covering the entire work

Vincent Astor To Be Ensign

Vincent Astor visited the quarters of the Second Naval Battalion, Naval Reserve, in Brooklyn, Monday night of last week, and made formal application for enlistment in the battalion's newly organized aerial corps.

Immediately Mr. Astor was put through the physical examination by the battalion's physician, Dr. Lynch, and was passed. Commodore Robert Forshew, head of the naval militia of New York State, received Mr. Astor's application. It is expected that in the course of the week he will take the oath of enlistment and begin his training.

If the present program is carried out Mr. Astor will be promoted to the office of ensign as soon as he has mastered the rudiments of naval aerial work. Later he will be made a lieutenant and be placed in charge of the battalion's aerial corps.

Mr. Astor gave out a statement in which he said that published reports to the effect that he had subscribed $5,000 of a $9,000 fund for purchasing a hydroaeroplane for the Second Battalion were not true. Eighty-seven contributors joined in raising this fund, he declared, in contributions ranging from $10 to $800. The latter contribution was from the Aero Club of New York.

"I was merely the treasurer of this fund," said Mr. Astor, "and I think that in fairness to the other men those reports should be denied."

Aerial Exhibits at Grand Central Palace

As noted in our columns two weeks ago there will be a very interesting aerial exhibit at the Third National Exposition of Safety, under the auspices of the American Museum of Safety, in Grand Central Palace, May 22-29. Suspended from the ceiling in the center of the Palace there will be a new L. W. F. Engineering Co. military tractor. Mr. Glenn L. Martin contemplates having one of his new model S. Seaplanes on exhibition, provided it can be shipped to New York on time. The Aeromarine Plane and Motor Co. will have one of their six-cylinder direct motors displayed, which Mr. Harry B. Wise will describe to interested parties. In the same section there will be a model of the new Delco-Lite system, one of the most economical methods of lighting hangars, small workshops, etc., and Mr. Winston Paul, who is also associated with the Aeromarine Co., will tell of its possibilities. A small balloon owned by the Aero Cub of America will be exhibited, and in the reception room of the Club, in the Palace, literature will be available, which will inform the inquiring mind as to our state of aerial preparedness, or rather lack of it. The Sturtevant Aeroplane Co. will exhibit parts of their new all-steel battleplane; the C-E Aeroplane Co. sections of their transcontinental flier; the Norma Ball Bearing Co. and the S. K. F. Ball Bearing Co. will explain the principles of their products by model and booklet; instruments of all kinds will be shown by A. Hautstetter, the Foxboro Co., the Veeder Co., Henry J. Green; the usefulness of the Pyrene fire extinguisher will be demonstrated; the Ericcson Co. will show a Berling magneto and its various parts; the Wright Co. will present parts and pictures of their product; the Curtiss companies will be substantially represented by motor parts, aeroplane parts, models, and pictures.

Limitations of space have prevented the utilization of many machines, but, altogether, the exhibit of aerial products promises to be one of the most interesting sections of the Exposition.

Chicago News

The Champion Aeroplane Co., of Chicago, is making preparations to occupy two of the hangars now being erected by the Aero Club of Illinois at Chicago's new flying field at Ashburn, Ill. They will build aeroplanes and conduct a school. The spring class will open May 15. Frank Champion, the well-known monoplane pilot, has been secured as chief instructor and Rudolph Sestak will be assistant instructor. Mr. Champion holds American License No. 86 and Mr. Sestak No. 260.

Mr. Frank Pontkowski, who has designed and built a number of successful machines used by the tractor biplane type, among which were the loop machine used by A. C. Beach in his successful exhibition season of last year. The company at its present location, Ogden avenue, is putting the finishing touches to the 90 h.p. Gyro motored tractor, built for Henry Marks. The machine will be flown by Lewis Gertson in his looping dates this exhibition season. It is specially designed for looping and will be given its trials the first week in May. For school work an 80 h.p. tractor biplane with dual control and 50 h.p. Gnome motored tractor will be used for license test.

The Late Capt. Jolain

It is with great regret that we learn of the untimely death of Captain Jolain, a pioneer of French Aviation.

Captain Jolain entered the aviation field as an Army officer in 1910. He attained great efficiency in the handling of the Henry Farman biplane and later the Maurice Farman. He was made commander of his escardielle at the front because of his brilliant career, which was terminated by an accident resulting in a broken leg. He was then removed to a hospital in Paris, from which he returned to the aviation field where he was stationed when he met with the unfortunate accident that caused his death. The accident occurred while carrying out an important military operation in which unusual hazards were involved.

Military Aviation News

First Lieut. Shepler W. Fitz Gerald, Aviation Section, S. C., to Fort Mills, Corregidor Island, for duty with the 1st Company, 2d Aero Squadron, Signal Corps. (March 4, P.D.)

Sick leave three months to 1st Lieut. Joseph C. Morrow, Jr., aviation officer, S. C. (April 17, War D.)

Leave two months, upon his relief from duty in the Signal Corps to 1st Lieut. James H. Van Horn, S. C. (April 18, War D.)

The following promotions in the Signal Corps are announced: To be master signal electrician, 1st Class Sergt. Milton N. Williams, April 1, 1916. To be first class sergeant, Sergt. Thomas L. Clark, April 1, 1916. To be sergeant, Corpl. James S. Collins, April 16, 1916.

The following promotions in the Aviation Section of the Signal Corps are announced: To be first class sergeant, Sergt. William C. Ocker, April 16, 1916. To be sergeant, Corpl. Albert D. Smith, April 16, 1916. To be corporal, 1st Class Private George Gordon, April 16, 1916.

The Aeroplane in Baseball

The first ball in the opening game at Newport News of the Virginia league this season was thrown from a speeding aeroplane by Victor Carlstrom, instructor in the Curtiss aviation school. The machine swooped down over the park and the ball parachuted to the diamond in the folds of an American flag.

The Burgess seaplane making its trial flights at Marblehead

Unique photographs of three types of Curtiss military tractor biplanes. The "Baby" tractor has a wing spread of twenty feet, is equipped with an OX2 motor, and is expected to make well over a hundred miles per hour. The tractor in the center is the J. N., the type which the government recently purchased for service in Mexico. The third machine—the double motored tractor—is of the J. N. type, equipped with two 160 h.p. motors. It will shortly receive exhaustive tests for weight carrying and duration. All of the machines are at the Atlantic Coast Aeronautical Station at Newport News

PATRICK Y. ALEXANDER IN NEW YORK

In the course of his ceaseless journeying around the world, Mr. Patrick Y. Alexander, one of the fathers of aviation in Great Britain, the first man to offer a substantial prize for an aeronautical motor, visited New York for two days last week. Mr. Alexander has devoted a large part of his fortune to the development of aeronautics.

Mr. Alexander's father, Andrew Alexander, was one of the founders of the Aeronautical Society of Great Britain in 1866. Patrick inherited a large fortune and his father's hobby. In 1878 he built his first glider model. As geographer and explorer he has trotted the globe in every direction. He was the official British observer of a Zeppelin's first ascent. He reported the Wrights' first flight, and was a close friend of Professor Langley.

So when Patrick Alexander talks about aviation, those who really know the history of its development give attention.

"The science of aeronautics is in its infancy," said Mr. Alexander. "No man can foretell its possibilities. Twenty years ago I was thought crazy for predicting what now has happened. But I do not see the end short of the neutralization of the force of gravity. Then we shall be able to launch a craft as bulky as the Aquitania and travel will be generally through the air. Don't tell me it is impossible! Some one yet will find the secret and unlock it. Some one will discover how to make Newton's apple fly back to the tree—perhaps a Chinaman, perhaps a Peruvian, perhaps some American genius will do it. It is no more incredible than flying seemed to be twenty years ago.

"There are three great new factors in this war that make it different from any other war that was ever fought," says Mr. Alexander. "They are aircraft, the wireless telegraph and the internal combustion engine. They have compelled such rapid readjustment that the older fighting men have been retired, and only the young men, abreast of these modern scientific developments, are generally being thrust into the positions of responsibility. We are now equipping aeroplanes with a wireless apparatus having a sending radius of 150 miles. I was astonished to be told that on this side your navy's aeronautical equipment so far has provided only ten or fifteen miles of wireless communication.

"It is true that England," Mr. Alexander declares, "has not attained yet her stride in aeronautics. We have 1,000 factories turning out aeroplanes or parts. Women are proving very faithful workers in the aeroplane factories as well as in other munition plants. What we need—and you need it, too—is aeronautical leadership. We have in Great Britain no less then fourteen unofficial 'Ministers of Aviation.' We need a head for the service. We need a man or men who can apply aeronautical science in offense as well as in defense. You must remember that the man who can do this must know naval as well as military tactics. He should be an admiral and a general and a geographer and a statesman, all in one. The day is coming for England, and for America, when the aeronautical branch will be more important than either the army or the navy.

"Your movement to take account of your industrial possibilities and provide for their mobilization is the most important step you have taken toward preparedness," he says. "Had we been thus prepared ourselves, the chances are that this war would be over by now. We have been able to buy aeroplanes in America. Fortunately they are good aeroplanes. You are turning out now some of the best aeroplane motors in the world. What you need now is some Henry Ford to standardize aeroplane construction so that a serviceable machine can be bought for $500 or $1,000. Aviation is not going to be forever the sport of wealthy men. The air is going to be the great, open highway over land and sea. We are going to travel through it because it is the quick, direct, delightful route. We are going to transport our wares that way, too. In another ten years we shall be thinking in terms of taking the Aquitanias and Mauretanias out of the water."

GOODYEAR TIRE CONTENTION UPHELD

All American tiredom is interested in F. A. Seiberling's victory this week over the Firestone Tire & Rubber Company in the United States District Court, in a suit charging infringement of the Seiberling-Goodyear tire-making machine patents.

The interest of tire manufacturers in the outcome of this suit brought by F. A. Seiberling, President of the Goodyear Company, against the Firestone Company was usually heightened because of the fact that while a large majority of tire manufacturers, both large and small, have been for some years building their tires upon machines licensed from Mr. Seiberling, a small handful of other manufacturers, among which was the Firestone Company, have refused to concede the validity of the patent on the Goodyear machines.

The Goodyear Company contended that the Seiberling-Stevens machine of 1902-3 was a pioneer invention and that it paved the way for the present-day semi-automatic tire-making machine; that the Seiberling-Stevens machine was the first ever produced to make automobile tires; that the Goodyear Company developed the first practical machine for making automobile tires mechanically that is now in use.

This Goodyear position is now confirmed in no uncertain terms by this late decision of Judge Killits of the United States District Court.

Prior to 1902 auto tire casings were made by hand. A diminishing few are still made that way. The rubber in a tire casing does little of the hard work of sustaining the load and stresses incident to forming a cushion between the automobile and the road. The hard work is done by the layers of cotton fabric that confine the air and form the real structure of the casing. Casings are built of rubber-impregnated fabric, a layer at a time. It is important that every part of each layer be stretched to the same tension, so each part of each layer will bear an equal part of each shock. Loose layers shirk their duty; layers stretched too tight do too much work, —and a tire is no stronger than its weakest point.

In the day of hand-made tires the tire maker depended entirely upon the strength of his arms for stretching his fabric layers. In the morning, when he was comparatively fresh and strong, he stretched the fabric tightly; in the afternoon his weariness was expressed in fabric laid more loosely. No two men's strength is ever exactly equal. Strong men made better tires than weaker men, and there was much to be criticised in the old hand-made method.

Realizing the uncertainty and inefficiency of the old way and the desirability of a mechanical apparatus for laying up the fabric, F. A. Seiberling, then and now the president of the Goodyear Tire & Rubber Company and W. C. Stevens constructed and in 1904 patented a tire-making machine. Like other pionner inventions, it lacked some mechanical refinements, but Goodyear tires were made on it and the machine proved to be practical.

Later improvements were made upon the original machine, and by 1908 almost all Goodyear automobile tire casings were machine made. This is true today. Moreover, more than one-half the tires made in the United States are now the product of Goodyear patent tire machines and new licenses are still being issued—the latest less than two weeks ago.

About three years ago the Firestone Company installed tire-making machines in its factory, without taking a license under the Seiberling patents. Goodyear maintained that the Firestone machines infringed on the Goodyear patents, and The Firestone Company was notified and asked to discontinue. The notice was not complied with, and Mr. Seiberling sued, with the result noted this week. Judge Killits' opinion ends thus: "Decree will run for the plaintiff, finding both his patents valid and infringed by defendant."

It was in 1907, when the Seiberling-Goodyear machine was perfected and Goodyear began making practically all its auto tire casings by machine, that the company's real growth began. This, Goodyear officials maintain, is because the machine method permitted the making of a better, more uniform product than was possible under the old method. Maximum strength could now be built into tires with an exact gauge and knowledge of results. In 1907 Goodyear made 28,685 tires; in 1916 the Goodyear output will exceed 3,000,000 tires; facilities are now being provided for the production of five and a half million tires in 1917.

THE DEVELOPMENT OF ENGINES SUITABLE FOR AERONAUTIC SERVICE

Origin—Means Used, and Results

By CHARLES E. LUCKE

(*Continued from page* 217)

Power-Weight Ratio, Reliability and Adaptability

If the engine complete with full tank is light enough it can be used—and is most useful when most light, and this weight involves many factors, each of which must be considered—some independent of others, but many interrelated. The longer the contemplated flight, the more change there must be in the relation between specific fuel and oil consumption of the engine and the weight of the engine proper; so in any consideration of this item length of flight must be included. Not yet, however, has the engine or flight art reached the point where it is prepared to fix a minimum weight, though each year sees a definite maximum. In fact, one of the problems of the day for the aero engine designer is to discover means for lowering more and more both this maximum permissible weight that many can attain, and the minimum possible attainable by only a few of the best—and with increasing flight lengths this is becoming more and more a matter of raising thermal efficiency, engine speed, and cylinder mean effective pressure, with corresponding reduction of lubricating oil. On the weight question, therefore, it is not the service conditions that specify what is wanted other than that it shall be as low as possible, but rather the engine designer is put on his mettle to say how far it is possible to go with due consideration to the other two elements—reliability and adaptability.

Reliability is demanded always, but how much? Some writers call for absolute reliability and others try to specify in numerical terms a value for one or another of its elements. For example, in the 1913 German tests, any engine that dropped to 85 per cent of its normal speed was rejected, and this stipulation was retained for the 1914 competition. Again, in the British conditons, the only power rating allowed was the least attained at any time in six hours. Now absolute reliability is impossible, for this would mean continuous, uninterrupted operation without variation in any respect, except at the operator's will. No such engine has ever been built, nor will it ever be built. Obviously what is wanted is as great a reliability factor as the engine designer and builder can secure consistent with other factors, so here again, as with the unit weight factors, the problem is one for the producer to say how far the reliability can be assured, rather than for the user to specify and reject, especially on laboratory tests. However, rejection on such grounds is far more justifiable than acceptance, for the engine so accepted may fail on its first flight, due to some accident or to faulty operator's adjustment. What is needed here is, first, analysis of the reliability factor into its elements and by co-operation between engine designer and user, an agreement on reasonable values for each, so one will not promise nor the other expect the impossible, but each understand clearly the limits—and, more important, the reason for the limit—that means may be sought to eliminate the disturbing cause.

About the same situation is true with the third factor, adaptability, and its elements—such as shape, vibration, silence, accessibility, uniformity of torque. They may be specified today only in the qualitative or comparative way, though some of them are capable of formulation, quantitatively, such for example as torque variations. So far it has not seemed feasible to impose any such limits but to leave the field wide open to the designer with an expression of desire for as high a degree of success as is possible with each.

The reason for this state of affairs in the art is clearly due to its youth and the necessity at present, and for some time to come, for the maximum possible encouragement of invention, design, research and manufacture, until it becomes clear to all just how far it is possible to go in any direction after engaging all available resources of talent, material, money and plant. When, after such a period, one or more standard types of engine or engine parts—or even of air craft itself—have been established, then will it be feasible to specify more particularly and numerically all the elements of each of the factors of unit weight, reliability and adaptability.

In the meantime, the problem is one of review of engines produced and an analysis of their construction and performance as a whole, and with it a similar analysis of fundamental possibilities. This must include a more or less standard examination of each of the essential parts of the engines and the relation of form and arrangement to the perfection or imperfection with which the part performs its particular duty or function. Even now, as Soreau, reporting the French tests, points out, the relative importance of low engine weight proper, reliability and life, and consumption of fuel and oil, originally considered in this order, has been reversed, experience indicating that the last is now first and the first last.

Part 1 (*b*).—MEANS EMPLOYED UP TO THE PRESENT TO PROMOTE AERO-ENGINE DEVELOPMENT, INCLUDING POSSIBLE MEANS NOT EMPLOYED.

Any new art develops as fast as encouragement is offered or as fast as the necessary means are made avilable and intelligently used, and, of course, inversely as the difficulties involved. It would be hard to find any class of machine among those developed in modern times that had to face the same inherent difficulties incident to the nature of the problem, or one that received, at least for the first few years, so little real encouragement and assistance as this one, the aero engine. The initial step is one of conception, which must be subsequently checked by construction and trial. This must be followed by commercial perfection, which requires endless research by test and computation—not only on the machines as a whole but to a larger degree on each element of the problem that analysis indicates to have separate entity, and on groups of elements that have co-ordinate functioning. Construction is here again necessary, not only of the complete machine, but also of variants on each part, and of instruments, appliances, models and apparatus that do not themselves enter into the result but are essential to its attainment. Finally, with commercial perfection, further construction work is necessary to create the means of rapid large scale reproduction within the limits of dimensions needed for interchangeability of parts, i. e., establishment of the manufacturing plant. It must be understood, however, that these three steps that must be undertaken in this order on general principles may not be repeated many times over even when concerned with the same product, such as the aero engine, or that the earlier step ceases when the latter is inaugurated, for this is not true. These three stages or periods of development may, for the want of better terms, be designated as, first, the period of invention; second, the period of design; and, third, the period of manufacture. Design can not be undertaken before invention, whether that invention be of the patentable sort or not. Yet invention undoubtedly proceeds long after design has been firmly established and, of course, while manufacturing may not be undertaken until both invention and design have accomplished a reasonably commercial perfect product, it goes without saying that both invention and design will continue during the whole of the manufacturing period.

With the exception of invention, which needs little encouragement beyond a stimulation of the imagination, the primary factor in successful development is money, for, with sufficient funds, the necessary professional skill, labor, materials and plant may be secured for carrying out the steps of design and manufacture. Of course, money may be, and usually is, misspent in these developments, especially when the control is in the hands of persons lacking engineering skill and experience, so there should be added the requirement that organization be associated with money.

No better illustration of this situation can be given than that of the steam turbine, whose period of development practically coincides with that of the aero engine, but which has been brought to a state of commercial perfection that the aero engine has not even approached, partly by reason of the better understanding of the service requirements that are not yet fully formulated for the flying machine, but almost entirely because of the differences in the means employed for the development. The steam turbine had its invention stage, and while invention still proceeds it is largely superseded by rational design for manufacture, under skillful guidance, under proper organization, suitably financed and satisfying an ample, well-understood market demand. The aero engine is still largely undeveloped, invention is still more active than design, and the almost microscopic, painstaking research re-

quired to establish the data necessary for design is almost wholly lacking, so naturally manufacturing in the true sense of the term is correspondingly non-existent, though a few individual models of engines are being reproduced in fair numbers.

The millions of dollars needed for rational perfection for manufactuer become available to the suitable organization ordinarily only when a permanent market is clearly in sight and when the service requirements of the product are reasonably definite. In the case of the aero engine, this market has been absent or at least very uncertain and the service requirements very hazy—both so much so that under ordinary conditions the aero engine could not have reached even the degree of perfection so far attained, unsatisfactory as it may be, without other incentives or different sorts of encouragement than the ordinary article of commerce receives as, for example, again the steam turbine. This special element in perfecting the aero engine is that of governmental aid based on military necessity, a ocmparatively recent force in the situation but now a very strong one in Europe, but almost wholly lacking in America. The military establishment can purchase what it needs in the market only when there is a reasonably strong civilian demand for the same article, strong enough to warrant the financial investment necessary for its perfection—and such is the case with the automobile and traction engine. On the other hand, when there is no such demand, however active invention may be, rational design and manufacture will be absent and must be supplied by the Army and Navy through their own organization and plants, or, as an alternative, reasonably steady annual governmental appropriations for purchasing sufficient quantities by the military departments may be made the basis of support for civilian production. Such is the case, for example, with ordnance and to some extent with ships.

For several years after the demonstration that engine-driven air craft could make successful flights, the only encouragement offered to development was that of adventurous sport. Men whose incomes were sufficient became purchasers of machines for their own amusement and others bought machines for making exhibition flights before paying audiences for the profit to be derived. Both sorts of operators took chances with the imperfections of the machine in a spirit of adventure or speculation, but practically all made short flights that made no such demand on the engines as is now standard. Men such as Eiffel and Deutsch de la Meurthe should be mentioned for their contributions of large sums of money for scientific investigations, not of engines, however, and of national subscription funds of France and Germany, all of which assisted in development. In many cases, even with these short flights, the engine was taken apart, cleaned, repaired and readjusted before each ascent. Even as late as September, 1912, Mr. Earle L. Ovington, writing in the *Scientific American,* reports:

> Usually every 15 hours of running, and at most every 20, my mechanics (skilled men) went through the interesting process of separating every single component part of my motor, one from the other. The valves were reground and retimed, because of valve-gear wear, new valve springs were inserted, the tappet rods were adjusted, and the whole motor was given a rigid inspection. The Gnome, in common with most rotary motors, uses castor oil as a lubricant, hence at each cleaning great quantities of carbon were removed. I claim that any engine requiring such attention may rightly be termed "delicate." How far would you get in an automobile if you had to take the entire engine to pieces and readjust practically every working part of the whole motor every 15 or 20 hours of service?

In an article in the *Auto Car* of March 28, 1914, we find the following statement:

> The Gnome engine requires cleaning out after about 24 hours' continuous running, if it is to be kept in tune. The French military regulations demand that the Renault be cleaned out after 200 hours' running. Users of other aeroplane engines have told the writer that cleaning carbon out is hardly ever necessary.

With such an uncertain and capricious market, perfection of the aero engine could hardly be expected in a whole lifetime, especially as the amount of business in any one country would scarcely suffice to support one producing establishment, and that one unable to bear the expense of the high-salaried engineers competent to supervise the work and when, at the same time, the stimulus to the imagination created by the idea of the mechanical flight produced thousands of inventions and inventors, each seeking and many finding financial support, under the influence of the excitement of the time rather than from any sound business basis. Failures necessarily must be numerous under such conditions, and every failure, whether of mechanism or finances, set back the art and discouraged the rest.

During this period the military organizations of all the nations watched results and purchased a few machines for experimental purposes, out of which grew the conviction now so firmly established and so thoroughly demonstrated in the present European war that, however imperfect the aeroplane, it is a military necessity and must be perfected. Perfection being impossible or too slow without governmental aid, plans were formulated by the European nations, one after the other, and, in addition to creating a corps of flying men with suitable co-operation with the military establishment, competitive tests for aero engines were organized by Germany, 1912-14; France, 1909, 1911 and 1913, in co-operation with the Ligue Nationale Aérienne and the Automobile Club de France; Italy, 1913, and England, 1914, in which substantial money prizes were offered for successful machines, and in some cases buying orders given to winners in the contest. It was the intention to make each of these contests an annual event, so as to not only continue the development of engines under this icentive, but to show clearly the annual progress by comparison of the entries in successive years on the basis of their performance, in relation to their form, materials, and proportions. The contests so far held are summarized in Appendix 1, which also reproduces the conditions and such of best results with some discussions and interpretations as are obtainable from published reports. Unfortunately the European war has interrupted reports of such tests as were completed in 1914 and prevented the carrying out of others, so that the latest information of this class is not now obtainable.

Besides these governmental contests with cash prizes and purchasing orders, which are undoubtedly the biggest single influence so far brought to bear on the rational development of the aero engine, there are some other co-ordinate factors to be noted, and these are civilian contests conducted by organizations interested professionally in promoting the art or by individuals, reports of which are also given in Appendix 1, with the Government contest reports. Among these private contests are to be noted, in France, competition of La Ligue Nationale Aérienne, 1911; Automobile Club of France, 1913; England, Alexander contest, first for British-built engines, 1909, and second for any engine, 1912.

Finally, there must be noted among these influences for good in the rational development of the aero engine the establishment of laboratories for testing engines alone or flying-machine supporting and control elements alone, or both engine and air craft, and reference is made to the paper by Dr. A. F. Zahm, May, 1915, reproduced in Appendix 2, with other laboratory references in addition to those contained in the contest reports of Appendix 1. Some of the results obtained in these laboratories are not published and apparently but little work has been done on engines. It is assumed that most of the laboratory work on engines so far done, is such as to be of value only to individuals seeking to perfect their own engine, or, believing it perfected, seeking an independent test report to enlist capital for manufacture or to serve as an advertising inducement to purchasers.

As a consequence, the conclusion must be that the largest single factor in the recent rapid development of the aero engine is governmental, involving the establishment of official organizations to study the problems, the operation of laboratories to determine by test the results attained by designers and producers, especially when large and regular purchasing orders are involved to support civilian developments and manufacturing establishments, or in the absence of sufficient orders, and perhaps in addition to them, the distribution of sufficient cash prizes, whether originating in governmental appropriations or private and institutional donations.

Great as has been their influence for good in aero engine development, these contests have not yet been under way long enough to have accomplished more than a small fraction of what may be so attained, nor can this contest means be regarded as either sufficient or without faults. There is an inherent danger that the results of such tests be misinterpreted, and in fact there is even a bare possibility that they may exert a retarding influence on the art. Naturally competitors design engines and enter them to win a prize, and the conditions of the contest become the controlling factor in the preparation of an engine for entry. If these conditions place undue weight on factors that are not of primary importance to the engine as it works in place in actual flight, it is easily possible that not only may the best engine from the actual service standpoint be rejected but, worse than that, the bulk of these workers who are engaged in development will be led away from lines that are truly legitimate in order that by following the lines prescribed by the rules they may secure the necessary cash to continue. In view of this possibility too much care can not be exercised in the preparation and regular revision of these contest rules and conditions in order that the result may be what is wanted and what is needed by the whole art, instead of a perfect attainment of a merely hypothetical standard.

(*To be continued*)

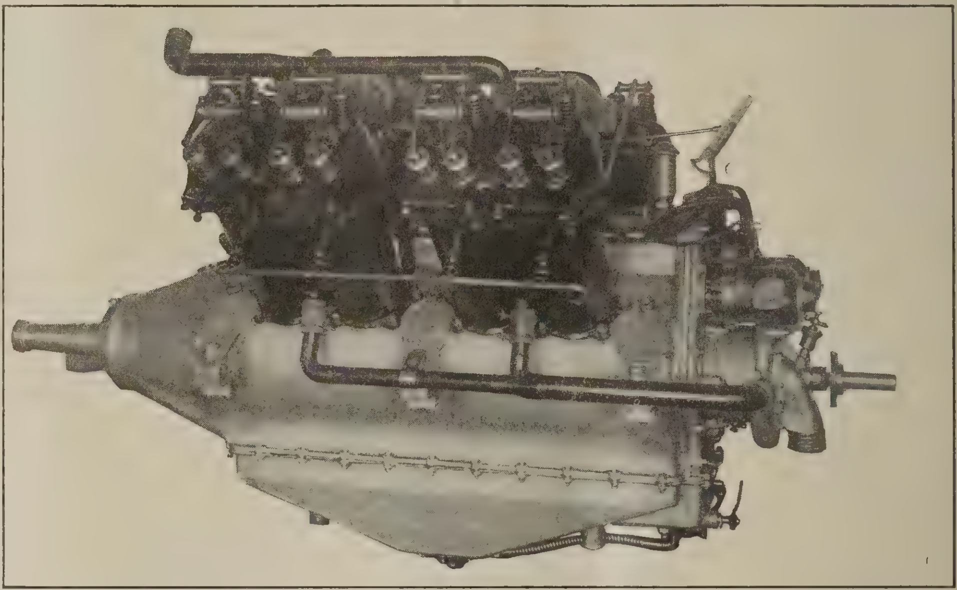
THE MARTIN AERONAUTIC MOTOR

SPECIFICATIONS.

Model—8200 Aeronautic Motor.
Size—4⅝-inch bore and 7-inch stroke.
Weight—484 pounds complete with two magnetos and two carburetors.
Type—Eight-cylinder Vee, four-cycle water-cooled.
Power—190 brake horsepower at 1400 revolutions per minute.

General Description: The general design of this motor is of the Vee type with the four cylinders in line on each side separated by an angle of 90 degrees. Exhaust ports are on the outside and the inlet ports and carbureters are within the Vee. Ignition equipment and circulating pump are carried on the rear end of the motor. The propeller is carried by a liberal extension of the crankcase far enough forward to allow a good entry form of engine housing.

One of the most important points, and one which largely determines the length of life of the motor in service, is that of ensuring that the physical qualities of the material of each part actually exceeds the requirements of the designing engineer. In the cast parts this is made certain by passing the castings only when test coupons attached to the same have been proved by rupture in the testing machine to pass the requirements. In the case of steel parts, samples of each bar or each billet are heat treated and likewise broken in testing machine. In addition all parts when finished are required to pass hardness tests with the scleroscope.



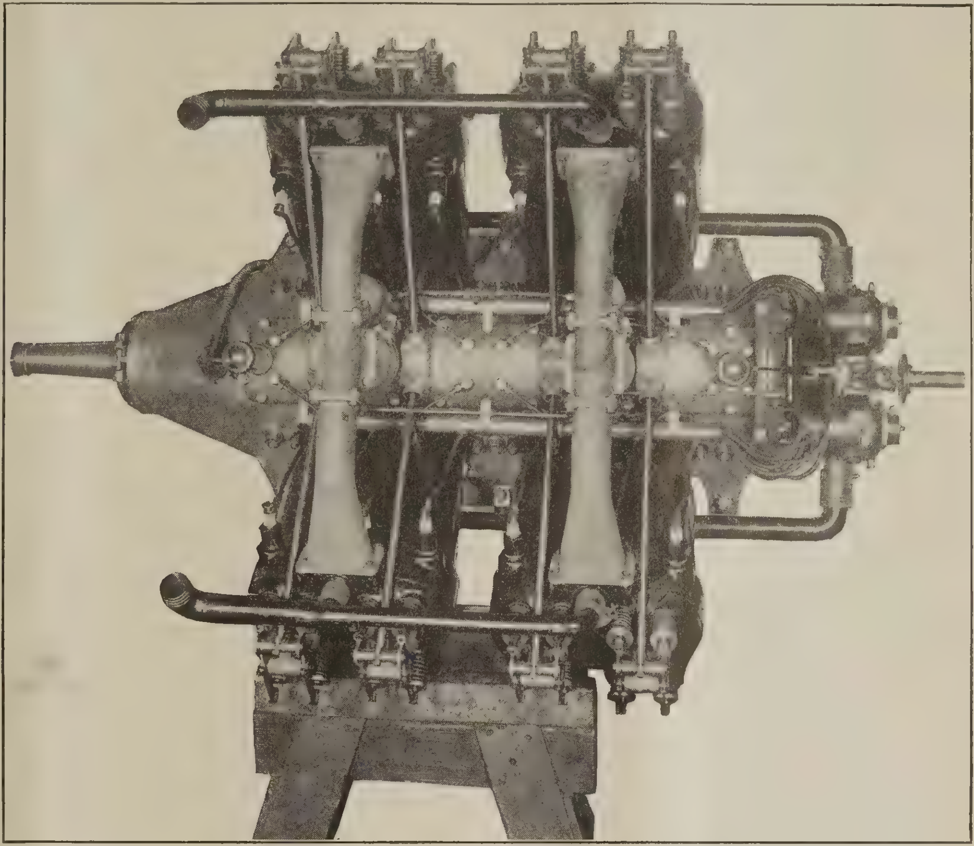
Although the crankshaft, propeller shaft, and connecting rods are machined all over, the crank and propeller shaft unit is dymanically balanced and the weights of connecting rod big ends and small ends are each brought to standard within one-half of an ounce. The weights of pistons, with rings and pins, are likewise standardized within a tolerance of one-half ounce. This care in balancing, together with the extremely rigid construction of the crankcase and main bearings, the ample size and consequent rigidity of crankshaft, as well as the shortness of the same, accounts for the remarkable freedom from the vibration which has heretofore been so very pronounced in this type of motor.

This motor developed 183 brake horsepower at 1,326 revolutions per minute at its recent official trial in the Aero Motor Testing Laboratory of the Navy Yard at Washington, D. C. This means a value of the brake mean effective pressure of over 116 pounds per square inch, a very remarkable result for so many cylinders and unprecedented in the field of light weight motors. Such results as this can be the outcome only of sound and careful engineering backed by the highest grade workmanship carried out in the finest material.

Motor dissembled to show crankshaft construction and double independent lubrication systems.

DETAIL DESCRIPTION.

Crankcase: Of the barrel type, with integral forward extension, giving the maximum rigidity of structure. The only joint being that with the oil pan, which is over 6 inches below the shaft center. The crankshaft and main bearings are inserted from the rear end. The supporting arms are the ends of complete trusses which pass entirely through the case. The material of this, as well as the oil pan and end plate and cam case cover, is a high grade alloy of aluminum.



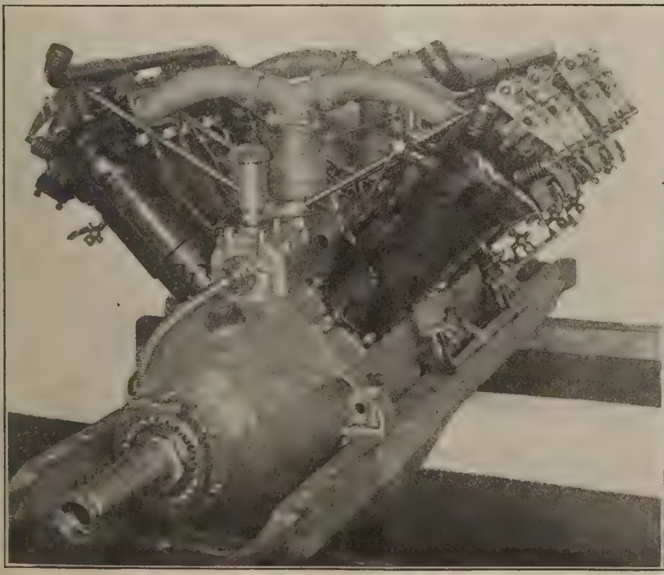
Cylinders: The cylinders are of the valve-in-head type and are made in pairs entirely of steel, being built up by welding the various components together into one integral structure. The only cast metal entering into the construction being the cast iron bushings for the valve guides. By this means exactly the right thickness of high grade rolled steel forms the walls throughout without consideration of those foundry difficulties which limit the efforts to eliminate useless metal in cast cylinders, to say nothing of the greatly superior stress resisting qualities of rolled alloy steel as compared to cast iron. While this method of construction is very expensive, when it is considered that one of these 4⅝-inch by 7-inch cylinder pairs complete with studs weighs only 24 pounds, although regularly withstanding a test pressure of 1,000 pounds per square inch, it is apparent that an enormous advance has been made toward the ideal light weight long life aeroplane motor.

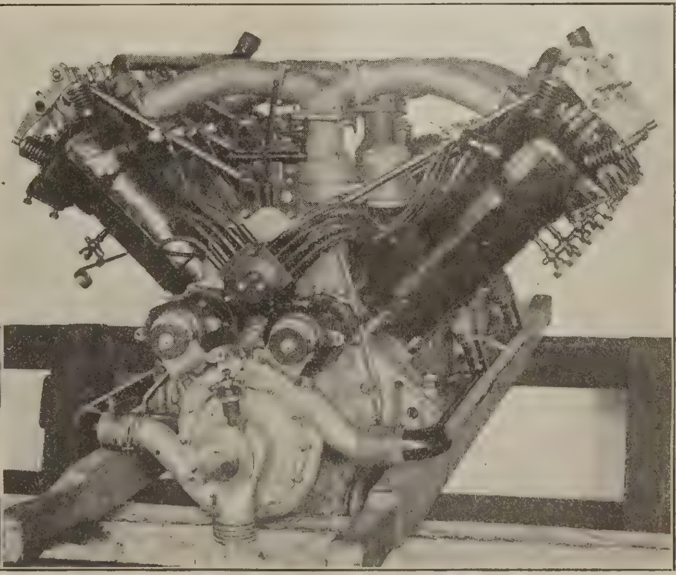
Valves and Valve Gear: The four large nickel steel valves in each cylinder are carried in and seat directly on the cylinder head without cages of any kind. They are operated by double rocker arms driven by a positive cam arrangement through a tubular rod. This cam mechanism is absolutely without springs and positively opens both sets of valves. All of the inertia and friction of the valve operating gear is taken care of by positive mechanical means, so that the double alloy-steel valve springs have only to seat the valves. All parts of valve gear are alloy steel, heat treated. All pin joints are bronze bushed and provided with felt pad lubrication from ample oil reservoirs.

Camshaft: This, together with the roller levers and rollers, is carried in a separate compartment of the crankcase, in the Vee formed by the cylinders. The cover to this compartment contains the bearings for these parts, thus forming a unit assembly that is removed from the motor as such. The integral camshaft is alloy steel, hollow, and the cams and bearings are case hardened and ground. The driving end is flanged to take the bolted-on driving gear.

Crankshaft and Propeller Shaft: These are machined all over from hand forgings of chrome vanadium steel, carefully heat treated, as are all other highly stressed parts, and are very robust members, the main and crank journals being 2¼-inch diameter and the combined unit of crank and propeller shafts weighing nearly sixty pounds. The crankshaft is carried in three white metal lined bronze bearings, totaling over 10 inches in length, in manganese bronze four bolt hangers secured to turned seats in crank-

(*Continued on page* 281)





FOREIGN NEWS

AUSTRIA

The official Austrian statement for May 5 is as follows:

"In the night an enemy airship crossed our lines at the mouth of the Wippach, dropped bombs and continued its raid northward in the Indria valley to Laibach and Sallach. On its return, our artillery and aviators attacked the airship, which took fire. The airship eventually fell to the ground near the Goritz drill grounds. The four occupants were dead.

Austro-Hungarian naval aeroplanes on May 4 bombarded Avlona in the morning and Brindisi in the afternoon. The Avlona batteries, the port establishments, and the aeronautic station were several times effectively hit.

At Brindisi full hits were noticed on railroad trains, station buildings, magazines, and in the arsenal and close to a group of torpedo boat destroyers. Several bombs exploded in the town.

Enemy aeroplanes ascended for defense, but were immediately driven off.

On the return trip fire was encountered from the Marco Polo (Italian armored cruiser). The crew standing crowded on the deck was effectively attacked with a machine gun.

In spite of a violent defense fire all the Austro-Hungarian aeroplanes returned safely from Avlona and Brindisi.

Official reports issued by the Austro-Hungarian Admiralty and General Staff on May 6 tell of Austrian air raids on the Russian lines in Volhynia and upon Italian bases in the Adriatic. Austro-Hungarian airmen bombarded the railway junction at Zdolbunovo, south of Rovno (in Russian Volhynia) day before yesterday. Hits were noticed and several buildings were set on fire.

FRANCE.

In the official report for May 1st, the announcement is made that in the month of April, thirty-one German aeroplanes were brought to earth. Six French machines were lost in the same period. During the night of April 29 and 30 French aeroplane squadrons threw down incendiary bombs on various railway stations in the hands of the Germans. Numerous fires broke out.

A French aeroplane and a Zeppelin fought at an altitude of 4,000 meters off Zeebrugge on April 26. The aeroplane fired nine incendiary shells at the Zeppelin, which appears to have been damaged.

The engagement, occurring more than two miles from the surface of the earth, was fought at 3 o'clock in the morning.

At the same time another French aeroplane, armed with cannon, fired numerous projectiles on a German torpedo boat off Ostend.

Elliot Cowdin, the American aviator with the French army, has been awarded the Military Medal, the highest war-time distinction in France. The award was made in consequence of Cowdin's bringing to earth the third enemy areoplane. It is said that Cowdin was offered a commission some time ago, but prefered to remain an uncommissioned officer in the endeavor to win the Medal Militaire (mentioned above), which can only be won by soldiers, non-commissioned officers and generals.

The following is the official French report for April 26:

An aviatik, which had lost its way, made a landing in our lines in the neighborhood of Rosieres, Gira. Two officers were taken prisoners. An enemy aeroplane, taken under the fire of our guns, fell in flames in the direction of Bagatelle, north of Four de Paris.

The German aeroplane which fell yesterday inside the enemy lines near Bauquois and was destroyed by our guns was brought down by Sub-Lieutenant Navarre. This is the ninth enemy machine brought to earth by him.

Last night our bombing aeroplanes were particularly active in the region of Verdun. Fourteen shells were dropped on the parks and bivouacs in the outskirts of Etain, four on bivouacs near Damvillers, six on the Brieulles station, fifteen on the Conflans station, six on the Joeuf-Homecourt steel works, ten on the Mezieres station and two on Rethel.

The same night our aviation corps similarly carried out numerous bombarding operations in the region of Roye. Eighteen shells were dropped on a munitions depot south of Villers-Carbonnel, where powerful explosions were heard. Twelve bombs were dropped on the Biaches bridge and thirty-eight to the north of Roye.

On the night of April 25-26 a German dirigible dropped about a dozen bombs in the region of Etaples, Reutin and Paris-Plage.

The official bulletin for April 26 is as follows:

Near Vauquois, an enemy aeroplane, which was compelled to land within its own lines after a combat was destroyed by our cannon. In the region of Verdun one of our reconnoitering aeroplanes brought down a German aeroplane, which fell at the Cote de Poivre, fifty metres from our trenches. A third enemy machine brought down by one of our pilots fell in the Bois de Forges. Finally, a Fokker aeroplane, fired on with a mitrailleuse by one of our aviators, fell vertically in the region of Hattonchatel. On the night of April 24-25 one of our dirigibles dropped ten bombs of 155 millimetres each and six bombs of 220 millimetres each on the railway station at Conflans.

GERMANY

The official report for May 1 is as follows:

"German aerial squadrons conducted extensive bombardments of the enemy's encampment and magazines west of Verdun. A French aeroplane was shot down in an aerial fight east of Royon. The occupants of the machine were dead."

On May 2 German aeroplanes were active in the Gulf of Riga, and also on the Scottish Coasts. Naval airships attacked the military installations on Moon-sund and at Pernau. Seaplanes attacked Russian aerodromes at Papenheim. Five German airships attacked the northeast coast of England and the southeast coast of Scotland. A few bombs were dropped in Yorkshire.

Although they admit that the Zeppelin L-20 was lost, the Germans claim greater success in the aerial raid than the English reports will admit. They claim that they successfully attacked factories, blast furnaces and railroads near Middlesborough and Stockton, industrial centers near Sunderland and the fortified port of Hartlespool.

Regarding the recent attacks by aeroplanes on the English coast and in the Baltic, the statement says:

"On the afternoon of May 3 a German naval aeroplane successfully attacked a British coast battery near Sandwich, south of the mouth of the Thames, and the aeronautic station west of Deal.

"In the Baltic naval aeroplanes are busily engaged. An air squadron again dropped bombs and scored several hits on the Russian battleship Slava and a submarine of the enemy at Moonsund.

"The aerial attack of the enemy on the German coast station at Pissen caused no military damage.

"A German submarine on April 30 shot down a British aeroplane off the coast of Flanders. The occupants of the aeroplane were rescued by an enemy destroyer.

"One of the German airships did not return from a raid on Salonica," says the Official German report of May 6 on the Balkan campaign. "According to a British report the airship was shot down and burned.

"South of Varneton," it says, "Sergt. Major Frankl on May 4 shot down a British biplane. This is the fourth aeroplane shot down by this aviator.

"Southeast of Diedenhofen (Thionville, in Northern Lorraine), a French aeroplane came to earth. Its occupants were made prisoners.

"A large number of French captive balloons, owing to a sudden storm, broke loose and were driven over our lines. More than fifteen have been captured up to the present time."

GREAT BRITAIN

Late reports of the capture by the Turks of the British forces at Kut-el-Amara make it known that aeroplanes were used in the effort to get food to the besieged British forces. The aeroplanes flew over the fortifications and dropped down bags of flour. However the Turkish aeroplanes were so much in the majority as to defeat the successful continuation of the plan. A Turkish official report, recently issued, says that a Turkish aeroplane brought down two British aeroplanes the day before the capture of the fortress.

The Zeppelin L-20, which took part in the raid on the English and Scottish coasts, on May 2, has been destroyed and driven ashore, according to reports from Stavanger. Some of the crew were rescued. The Zeppelin was seen to be flying low north of Sandnaes on May 3, and five or six men were seen to jump from the airship. It was then driven toward a hill by the wind and not under control and broke against the side of the hill.

The latest reports of casualties resulting from the raid place the deaths at nine and the injured at twenty-seven. One of the crew of the wrecked Zeppelin made the following statement:

"We were not damaged by English anti-aircraft guns. They only began shelling us after we had discharged most of our bombs. Not a single shell burst within one hundred yards of our dirigible. For some reason or other our petrol supply became exhausted. As we passed out over the coast on the return to our base we were caught by a gale that drove us eastward at terrific speed. In fighting the wind we only damaged our craft beyond repair, and from that time we simply drifted at the mercy of the wind until we struck the coast of Norway. Six men volunteered to remain aboard and destroy the machinery, so that Count Zeppelin's secrets would not be divulged. Three escaped. The others were crushed to death as the dirigible settled."

On May 5 a British aeroplane landed at Sluis after an exciting flight across Belgium pursued by a squadron of enemy aeroplanes and was interned.

The pursuit was so hot at one point that the British aeroplane was compelled to descend on Belgian soil, but a few minutes later reascended and made a dash for the Dutch frontier, which it reached in safety.

A Zeppelin made a raid on Saloniki on May 5. It was subjected to a heavy fire and was reported brought down.

The populace was awakened at two o'clock Friday morning. Searchlights in the harbor soon caught the intruder, which was directly over the town, and a hurricane of shell was thrown at it. The new French incendiary projectiles made an interesting spectacle. They lighted up the whole town as they shot upward. The Zeppelin seemed to lose its bearings and turned toward the sea, presenting a magnificent broadside. One shell which burst close to its tail caused the Zeppelin to dip and drop lower. It then faded from sight, apparently enveloped in a cloud of vapor. Nothing more was heard for a half hour, when two loud reports, followed by a great flare lasting several seconds, betrayed the fact that the airship had met its fate close the the estuary of the Vardar River. Much credit is due to a French airman who ascended in pursuit of the Zeppelin and dropped two bombs on it.

A British official statement issued on May 6 is as follows:

A further report has been received from Vice Admiral de Robeck concerning the Zeppelin brought down at Saloniki. It is now stated that survivors of the crew have been found, and that four officers and eight men have been made prisoners.

There was an attack on the British coast on April 24 by three Zeppelins. The War Office issued a statement saying that three Zeppelins had appeared over Norfolk and had thrown a few incendiary bombs. There were no additional statements given out for publication concerning the damage done.

The raid was preceded by a reconnaissance about twelve hours before the appearance of the Zeppelins by a German aeroplane. The aircraft appeared over Dover, in Kent, perhaps a hundred miles to the south of the district visited by the Zeppelins. No bombs were dropped by the aeroplane, but whether this was due to the promptness with which the British anti-aircraft guns opened fire on the aeroplane or because it was merely on a recoinnoitering trip is not known.

The statement issued by the British Admiralty is as follows:

Two Zeppelins crossed to the coast of Norfolk at 10:30 o'clock to-night and another appeared about 11 o'clock. A few incendiary bombs were dropped.

At 11:45 to-day a hostile aeroplane appeared over Dover from the east. It circled over the town at a height estimated at 6,000 feet. Anti-aircraft guns at once came into action and the hostile machine was driven off. No bombs were dropped.

ITALY

Four Italian hydroaeroplanes effectively bombarded Durazzo, according to an official statement issued May 6. All four aeroplanes returned unharmed. This attack was in the nature of a reprisal for an earlier attack made by Austrian aeroplanes on Avalona and Brindisi.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

NATIONAL MODEL AEROPLANE COMPETITION

Hand Launched Distance Contest Results

Mr. Alan R. Hawley, President of the Aero Club of America and Chairman of its Contest Committee, has so far received reports on the April contest of the National Model Aeroplane Competition for 1916 from four of the competing Model Aero Clubs. These are: The Aero Science Club of America, New York City; The Illinois Model Aero Club, of Chicago, Illinois; The Texas Model Aero Club, of Dallas, Texas, and The Bay Ridge Model Aero Club, of Brooklyn, N. Y.

The results of this contest indicate that a keen interest is being taken by the various Model Aero Clubs throughout the country, to stimulate which cash prizes amounting to $695 have been allowed from the National Aeroplane Fund.

The April Contest was for distance, launched from hand, for rubber-strand driven models, and the results so far received are tabulated below:

Aero Science Club of America

Egbert P. Lott: Monoplane Twin Pusher
1st trial .... 212 feet
2nd trial .... 200 feet
3rd trial .... 1,779 feet

Wallace H. Lauders: Monoplane Twin Pusher
Wrecked

Frank Broomfield: Monoplane Twin Pusher
1st trial .... 1,255 feet
2nd trial .... 1,120 feet
3rd trial .... 299 feet

C. W. Meyer: Twin Pusher
1st trial .... 2,342 feet
2nd trial .... wrecked

Rudolph Funk: Twin Pusher
1st trial .... 1,394 feet
2nd trial .... 392 feet
3rd trial .... 1,966 feet

F. C. Thiele:
1st trial .... Wrecked

Illinois Model Aero Club

Ward Pease:
1st trial .... 4,423 feet
2nd trial .... 4,225 feet
3rd trial .... 3,630 feet

Willis Hitt:
1st trial .... 3,238 feet
2nd trial .... 3,205 feet
3rd trial .... 1,490 feet

Thomas Hall:
1st trial .... 3,133 feet
2nd trial .... 5,337 feet
3rd trial .... 60 feet

Ellis Cook:
1st trial .... 206 feet

Donovan Lathrop:
1st trial .... 219 feet
2nd trial .... 80 feet
3rd trial .... 31 feet

Joseph Lucas:
1st trial .... 570 feet
2nd trial .... 510 feet
3rd trial .... 251 feet

Texas Model Aero Club

Homer Smith: Monoplane Twin Pusher
1st trial .... 2,320 feet 5 inches
2nd trial .... 2,015 feet
3rd trial .... 752 feet 4 inches

Carl Gildemeister: Monoplane Twin Pusher
1st trial .... 1,322 feet 4 inches
2nd trial .... 1,304 feet 5 inches
3rd trial .... 935 feet 9 inches

Merriman Smith: Monoplane Twin Pusher
1st trial .... 156 feet
2nd trial .... Wrecked
3rd trial .... Wrecked

Members of the Aero Science Club participating in an R. O. G. contest. Mr. Edward Durant, Director, at the extreme right

Bay Ridge Model Aero Club

L. J. Bamberger:

Wrecked

W. F. Bamberger:
1st trial ....1,030 feet

William Heil:
1st trial .... 724 feet
2nd trial .... 880 feet
3rd trial .... 382 feet

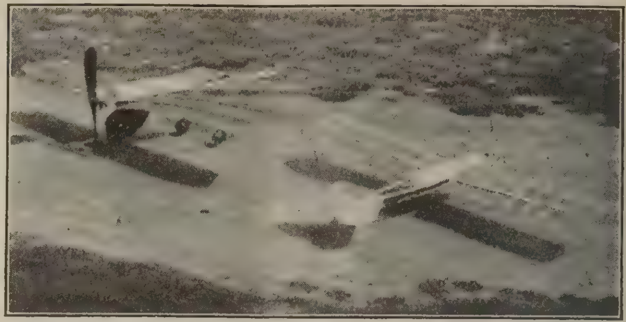
H. McMickle:
1st trial .... 676 feet

Comparing these reports with those received during the National Model Aeroplane Competition for 1915, the Contest Committee is much pleased with the results of this first contest of the 1916 competition.

The contest for May is for Duration, rubber-strand driven models, launched from hand. The competing clubs can greatly assist if the entry blanks for this contest are promptly sent in, and the report blank forwarded as soon after the trials are held as possible. Care should be taken in filling out the report blanks to give all data requested; type of model used, etc.

The Illinois Model Aero Club

Last Thursday the I. M. A. C. held the May finals for Villard Hand Launched Distance. Absolutely unexpected were the results of the meet, three members of the club, one a "dark horse" made a succession of flights that will stand forever in model history without equal. Mr. Thomas Hall, an old member of the club came to the front unexpectedly with a winning distance of over a mile, 5,337 ft., breaking all world's records and setting a mark that may stand for years. Mr. Thomas Hall used a speedy twin push and had the most perfect control of any operator on the field. Mr. Ward Pease was second with another great flight of 4,425 ft. Mr. Pease made other flights of 4,423 and 3,630 ft. Mr. Willis Hitt with the same model that won the I. M. A. C. distance finals last year took third with a remarkable flight of 3,238 ft. His other flights were very close to this one. There were three flights of over 4,000 ft. and four over 3,000 ft. The last three fliers did not live up to the club's reputation and did poorly.

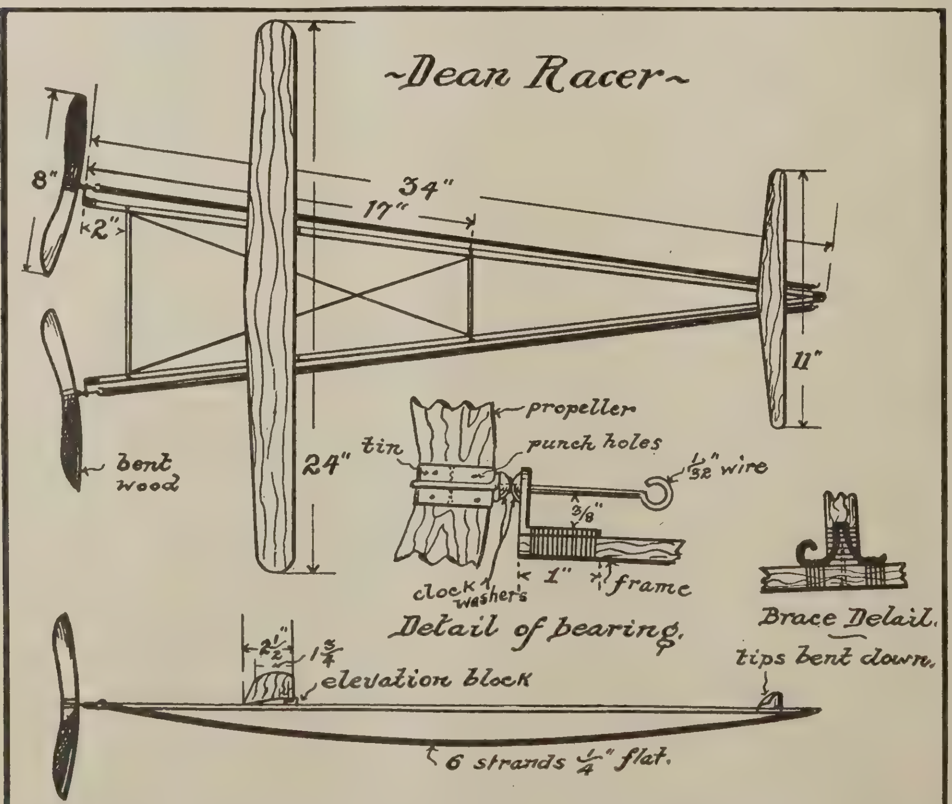


One of the chief objects of the National Model Aeroplane Competition instituted by the Aero Club of America is to stimulate interest in the development of compressed air motors for model work. The results of the model flyers in the vicinity of New York have thus far been successful. Two of the most enthusiastic persons interested in this type of motor are Messrs. John McMahon and Frank Schober both members of the Aero Science Club of America. The compressed air driven models as shown in the accompanying photograph were constructed by these gentlemen, the tractor monoplane on the right was constructed by Mr. John McMahon and the pusher monoplane on the left by Mr. Frank Schober. Both models are driven by motors of the two-cylinder opposed type.

The Dean Racer

The model shown in the accompanying drawing was constructed by Mr. William L. Dean, formerly of England, but who is now in this country devoting a large amount of his spare moments in the interests of model aviation. Mr. Dean has been the constructor of a number of successful models. Perhaps one of his most successful models is the Racer illustrated and described herewith.

Fuselage is constructed of two strips American whitewood ¼ inch square, 34 inches long. They are joined together at front to form a point. A "W" of 1/32 in. diameter steel piano wire is fitted thereover and bound with white silk thread and shellaced. Seventeen inches from the front, or apex, of the fuselage is a cross stay or brace of "dowel wood" planed to a streamline section ¼ in. by ⅛ in. and 3½ in. long. The rear brace is the same thickness, 6¾ in. in length, placed 2 in. from the rear of the fuselage. These braces are secured to fuselage by means of small nails. Fuselage is braced by diagonal braces of No. 2 guitar wire and these attach to hooks secured at upper and lower junctions of the wooden cross braces, as shown. By merely turning the hooks inwardly the diagonal wire braces are tightened.



Propellers are 8 in. in diameter, with a blade width of 1⅜ in. They are steam twisted, the wood being hard quality, straight grained, American whitewood 1/16 in. thick. Bent around the hub of propeller is a strip of sheet tin, secured to the blade by punch holes. Bent around this strip of tin is the shaft of 1/32-inch. steel piano wire, which goes completely around the tin strip and ends in a spiral on the inner side of the propeller, where it is soldered. Mounted on the fuselage, by binding and glueing, are brackets of sheet brass, ¼ in. wide by 1/16 in. thick, drilled for the reception of propeller shaft; and fitted on said shaft are two ¼-inch. clock washers of steel acting as bearings.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Soldier in the Sky

While blaring bugles sound the charge,
  And bees of battle sing,
And guns a deadly anthem roar,
  And Death is on the wing,
And siege and sortie leave the brave
  In crimson heaps to die,
Look up, O armies! and behold
The soldier in the sky.

A speck against the distant blue,
  A dot against the sun,
He rides about the rolling clouds
  Defying sword and gun,
He drops a bomb and speeds away
  Through spaces vast and high,
Our fondest hopes are fixed upon
  The soldier in the sky.

Though angry batteries below
  May spout a shower of lead,
It's hard to hit a moving mark
  That hurtles overhead.
A brother to the birds he soars
  Where eagles fear to fly,
The war-lord of the overworld.
  The soldier of the sky.

—MINNA IRVING in Leslie's.

Our Own Hashimura Togo

(Apologies to Wallace Irwin.)

Editor of that Dear AERIAL AGE (which I hope it rises like name):

My last place of disemployment were at Hon. Garden City, where I am expert nurse girl to many horses power aeroplane. Having great anxiety to rise in air, I take position to turn propelling stick at word of aeroplane pirate.

"What experience are you in aviationing?" Hon. Aviator ask it.

"I drive Fordish automobile for two year," I snagger with Samurai expression.

"You are engage", (this from him).

At once I become workish. With much ambition I wear skating hat, and suit, which are like those of American Feetball Player. Upon turnings by me of propelling stick, I hear not complaining of motor. Why not? I report with expression! Because of and firstly find out by aeroplane pirate, absence of turned on Gas. Why must be illuminations method of remaining off from ground? I then observe this are many intelligence engine which are not possible to fool without presence of gas. Such knowledge by pieces of iron! Again I make downwards pressure on propelling paddle, which annoy motor to extent of quick kicks resembling force of Hon. American mule in backwards direction. Explete discourage are enjoy by me!

It then rain and we do not flight.

Next day Hon. Aviator say: "We depart very speed for new aviations grounds."

"What I am do?" I deplore.

"Knock down Hon. aeroplane in hurry," he answer this. Such cruel! However with faithful expression I take axe and commence beatings with complete demolishments.

Hon. Aviator become bluish of expression.

"What for and why?" he ask me it with many Hon. American words of curse.

"As instruct, I correspond with face of frighten. When I recover in hospital I am very much careworn and suicide. Hoping you are the same, HASHIMURA TOGO.

Roundabout

Necessity is the mother of invention, and the hungry French aviator told about in a biography recently published in England illustrates the old adage anew.

He was in an English restaurant, and wanted eggs for breakfast, but had forgotten the English word. So he got around the difficulty in the following way:

"Vaiterre, vat is dat walking in the yard?"

"A rooster, sir."

"Ah! and vat you call de rooster's vife?"

"The hen, sir."

"And vat you call de children of de rooster and his vife?"

"Chickens, sir."

"But vat you call de chicken before dey are chicken?"

"Eggs, sir."

"Bring me two."

An exhibition flyer found himself in a remote village inn when a heavy downpour of rain set in. "I say!" he said, addressing the waitress. "It looks like the flood."

"Like what?" the girl inquired.

"Like the flood. You have read of the flood, and how the ark landed on Mount Ararat, haven't you?"

"No, sir," admitted the waitress. "I ain't seen a newspaper for more'n a week."

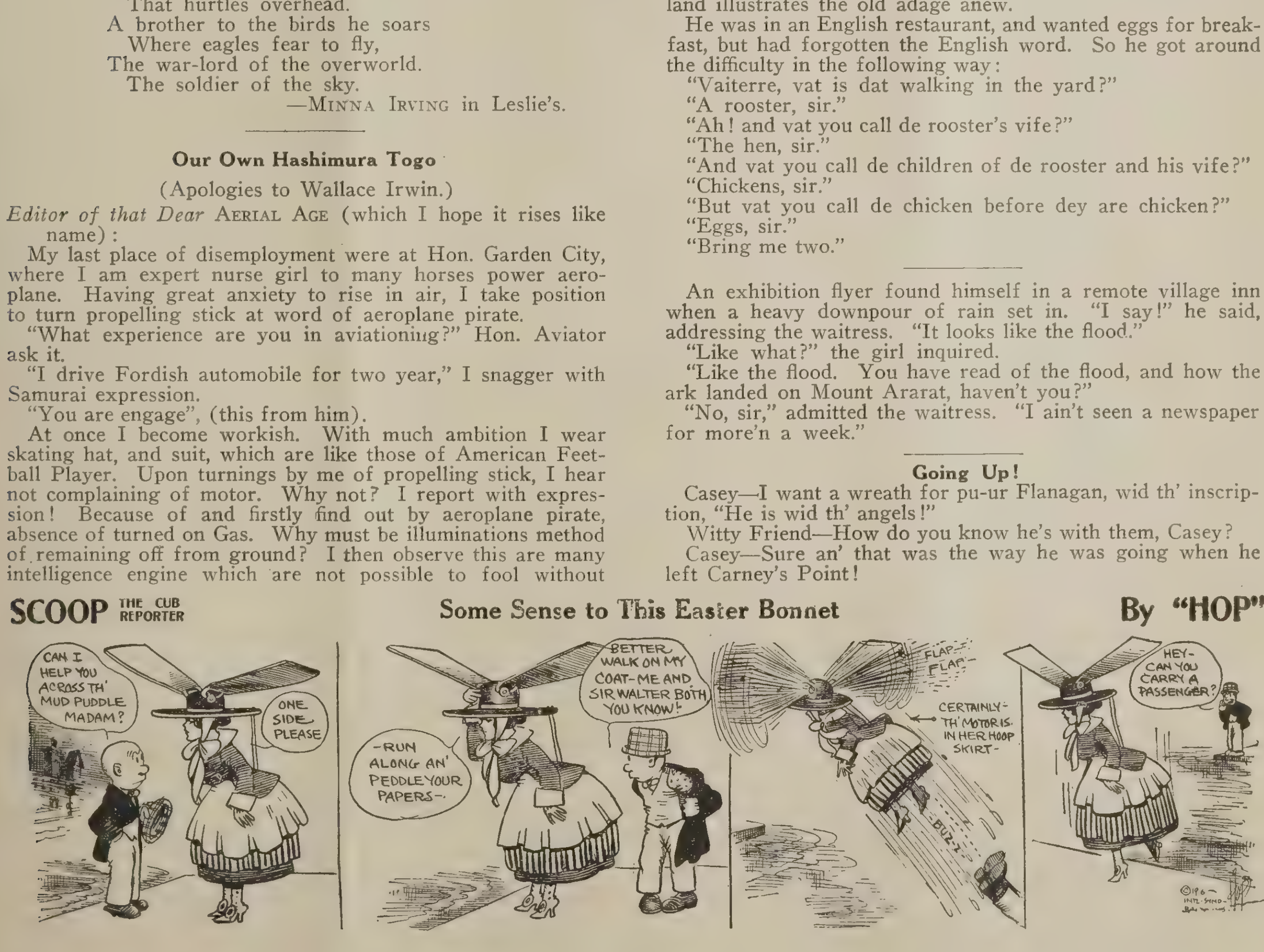
Going Up!

Casey—I want a wreath for pu-ur Flanagan, wid th' inscription, "He is wid th' angels!"

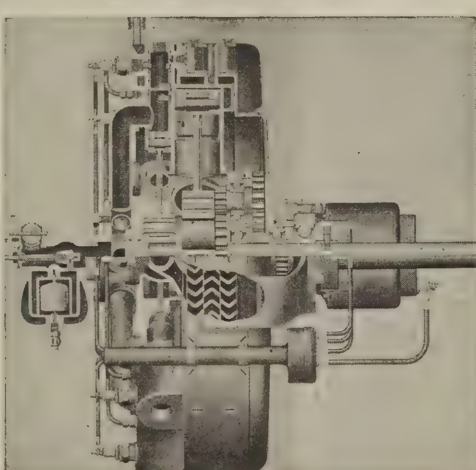
Witty Friend—How do you know he's with them, Casey?

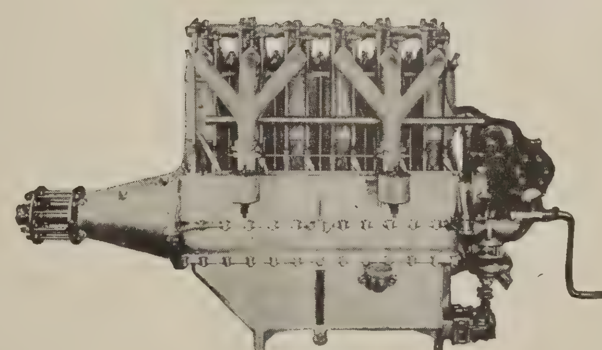
Casey—Sure an' that was the way he was going when he left Carney's Point!

SCOOP THE CUB REPORTER — **Some Sense to This Easter Bonnet** — **By "HOP"**




MILITARY Curtiss TRACTOR
THE MODEL R
BUILT FOR SPEED
AND
WEIGHT CARRYING
POWERED WITH
CURTISS 160 H. P. MOTOR
SPECIFICATIONS ON REQUEST
THE CURTISS AEROPLANE CO.
BUFFALO, NEW YORK





Burgess News

A scale model of the Rodman Wanamaker Trans-Atlantic flying boat is now under construction by the Burgess Company in conjunction with the Curtiss Aeroplane and Motor Company, of Buffalo. This machine will be ready for its trials during the latter part of the summer, and will be put through every conceivable test to develop possible weaknesses in the design of the full size craft.

The object is, of course, to make the real Trans-Atlantic flier as nearly perfect as possible. The model machine will have a span of about sixty feet, and will be equipped with two Curtiss motors of 60 horsepower each. It will be built to carry two men, for whom accommodations are made in the hull. The hull will also house gasoline tanks and supplies.

The aeroplane itself will be a triplane following the type originated by J. B. Dunne, the Englishman, and developed so successfully by Mr. Burgess. There will be no vertical rudders, and the steering will be accomplished through the action of the ailerons out at the wing tips.

Meanwhile, construction of the full size machine will go on either at Buffalo or at Marblehead, as tests of the scale model settle various points which are now matters of uncertainty.

It is expected that through this experimental work the construction of the full size machine can be accelerated to such a degree that the craft will be completed some time during the coming fall, in which case its trials will take place in the vicinity of Marblehead.

Among the recent flights at the Burgess School may be mentioned the following:

April 27. Aviator C. L. Webster in Burgess-Dunne No. 13, wind velocity from 12 to 15 miles an hour, with Norman Cabot as passenger, flight of 13 minutes. In the afternoon with the same passenger two flights of 16 and 7 minutes each. Following, J. J. Cabot went up for his first training flight and was in the air 13 minutes. Stevenson MacGordon in a navy school machine made a flight of 28 minutes.

April 29. Aviator Stevenson MacGordon in a navy school plane, wind velocity from 10 to 18 miles an hour with C. L. Webster as passenger and full load, two flights of 30 and 10 minutes respectively. In the afternoon the same pilot ascended with Lieutenant G. Murray, U. S. N., for test flight of 11 minutes. Aviator C. L. Webster in a Burgess-Dunne three practice flights of 13, 14, 8 minutes with Geo. Fearing, J. J. Cabot and Norman Cabot respectively as passengers.

April 30. Aviator Stevenson MacGordon in a navy school machine, wind velocity from 5 to 10 miles an hour with full load and Aviator DeGears as passenger, a flight of 41 minutes, DeGears driving during part of the journey. Aviator C. L. Webster in a Burgess-Dunne with Aviator Stevenson MacGordon, a flight of 15 minutes with MacGordon operating the machine the greater part of the time. During this flight the Burgess-Dunne climbed 1,525 feet in five minutes. Following Mr. Webster took up J. J. Cabot, Geo. Fearing and Norman Cabot in the order named for practice flights of 14, 13, 12 minutes respectively.

May 1. Aviator C. L. Webster in a Burgess-Dunne, wind velocity from 15 to 18 miles an hour, practice flights with J. J. Cabot and George Fearing, 15 and 9 minutes. During the afternoon the same pilot with J. J. Cabot landing and get away practice for one hour.

May 2. Extremely rough air conditions, wind velocity from 10 to 12 miles an hour. Aviator C. L. Webster, several test flights in Burgess-Dunne solus.

May 3. Aviator C. L. Webster in Burgess-Dunne, practice flights with F. Korman 17 minutes in extremely rough air conditions, wind velocity from 5 to 13 miles an hour. Following practice flights with Mr. Phillips 23 minutes, Geo. Fearing 20 minutes and 14 minutes, and Godfrey L. Cabot 35 minutes. In the latter flight Mr. Cabot operated the machine from start to finish without any aid whatever.

Aero Club for Kentucky

Tentative plans for the formation of an Aero Club of Kentucky, with headquarters in Lexington and branches throughout the State, to be incorporated with fifty charter members and to be affiliated with the Aero Club of America, have been made known by Lieutenant Keeling G. Pulliam, Jr., Kentucky National Guard appointee to the Curtiss Aviation School. Lieutenant Pulliam is promoting the club with the view of including Kentucky in the list of states in which aviation has been officially recognized, and to prepare Kentuckians for aviation duty in case the United States should be drawn into war.

According to the present plans Lexington is to be the headquarters of the State organization with Lieut. Pulliam in active charge of the formation of the local club. The Louisville branch of the club will be organized by Dr. Vernon Robbins, who came to Lexington recently and discussed the plans of organization.

(*Continued from page* 273)

case by six heavy bolts. The propeller shaft is a separate member flanged and bolted to the crankshaft just forward of the front main bearing. Although this propeller shaft is 2¾-inch diameter and carried in a very large combined radial and double thrust ball bearing at the forward end, and therefore not likely to accidental damage, this construction permits its ready replacement and consequent protection of the more expensive crankshaft. The double thrust bearing permits the use of either tractor or pusher blades, and these are bolted permanently in separate double flanged propeller hubs, which are in turn secured to the propeller shaft by long keyed taper and nut. Both flanges drive the propeller and the hubs are provided with means for easily and quickly removing them from their seat.

Timing Gears: These are cut with helical teeth from alloy steel and have a face width of ¾-inch. The intermediate is carried between two radial ball bearings. All are flooded with oil overflowing from the cam compartment.

Connecting Rods: As the cylinders are directly opposite, half the rods are forked and clamp the white metal lined bronze big end bearings, while the other rods are provided with hard steel liners and have an oscillating bearing on the outside of the big end bearings, and which in turn have a bearing 3⅛" long on the crank pin. Rods are machined all over from chrome vanadium steel, are of I-section, and the small end clamps the piston pin, which thus takes its bearing in the piston bosses.

Pistons: These are of aluminum alloy, properly designed for strength and heat conductivity, and run extremely cool. They are provided with one plain and one compound ring. Piston pin is 1¼-inch diameter and has a total bearing length of 3 inches.

Lubricating System: The oiling is taken care of by a double independent pressure and splash system. One pump draws oil from a main supply tank, which is carried in such a position on the aeroplane as to insure good cooling, and delivers it to four splash troughs, from which it overflows back to supply tank. This insures a constant supply of cool oil coming into the motor and also maintains a constant supply within the motor for the pressure system. The splash troughs raise and lower with the throttle opening, thus supplying the lubricant from this source in proportion to the requirements of the motor. The other pump draws oil from the sump and delivers it under pressure through an adjustable by-pass valve to the forward end of the tubular camshaft and through suitable ducts to the main bearings and thence to crankpin and oscillating bearings. The camshaft also acts as a distributor to supply extra timed lubrication to the cylinders. The pressure by-pass valve is also connected to the throttle, so that the lubrication from this source also is proportioned to the motor demand. The escaping oil from camshaft bearings floods the cams and rollers. This system permits idling without smoking and yet insures ample oiling when running full power. The splash troughs and sump are so arranged that inclination of the motor 30 degrees in any direction does not interfere with proper lubrication.

Cooling System: A large, enclosed runner, double volute, double discharge, centrifugal pump, driven direct from crankshaft through flexible connection, circulates the more than ordinary amount of water by direct short leads to the cylinders, from which it leaves at the highest point. The water circulates entirely around all valve seats and guides, spark plug bosses and combustion chamber surfaces.

Ignition System: Two synchronized single magnetos are used, driven at twice crankshaft speed, the current from which is taken to a special double distributor of convenient and compact design and which is driven by the rear end of the camshaft. The magnetos and distributor are so connected mechanically that synchronism is maintained throughout the range of advance. The high tension leads are short and are carried in neat supports. The two plugs in each cylinder, giving two point ignition, are so located as to be in fresh gas and to be self cleaning.

Presentation of Hydroaeroplane to Second Battalion

More than $8,000 has been subscribed for the purchase of a hydroaeroplane by prominent New Yorkers, which it is planned to present to the Second Battalion of the Naval Reserve, with headquarters at the foot of Fifty-second Street, Brooklyn, on June 1. The machine is being built by Burgess Dunn in Boston and will fulfill all the Government requirements.

The gift is the result of the wish of the donors to provide adequate protection to the ports of this country. Vincent Astor, Charles Lawrence, Meredith Blagden, and Aymar Johnson were the committee collecting contributions.

On the day the presentation is made there will be a demonstration flight across the lower bay, Samuel S. Pierce, who will have charge of the hydroaeroplane division of the Naval Reserve, being the pilot. Although only twenty-three men are required for a hydroaeroplane division, more than double that number have filed their applications with the Second Battalion.

Among those whose contributions made it possible to buy the first machine are: the National Aeroplane Fund founded by the Aero Club of America, Vincent Astor, George F. Baker, Jr., Edmund L. Baylies, James Gordon Bennett, William Berri, E. C. Converse, John A. Dix, Anthony Drexel, F. T. Freylinghuysen, L. Gordon Hammersley, Averell Harriman, E. H. Harriman, Dr. Malcolm McBurney, J. Pierpont Morgan, William C. Muschenheim, Mortimer L. Schiff, John Sloane, J. A. Stillman, Willard Straight, Benjamin Tuska, Langdon B. Valentine, and William Ziegler, Jr.

United States "Safety First" Train

The United States Government will endeavor, for the first time, to acquaint the people of the United States with the various methods adapted by the Federal Government to further personal safety.

The Federal Government's activities along these lines have been explained to those who were fortunate enough to attend the various expositions and world's fairs; but the great majority of persons have little knowledge of the vast organization effected to protect the people in peace as well as in war.

Accordingly twelve steel cars were taken from the regular service of one of the large railroad systems and placed at the disposal of the Government. The interior of these cars have been arranged by the various departments of the Government, embracing the Treasury, War, Navy, Interior, and Agriculture Departments, Interstate Commerce Commission and American Red Cross Society.

The train will be exhibited in all the cities and towns of any importance in the United States.

The Navy Department has devoted a section of their car to aviation. A working model of a monoplane fitted with the Sperry Automatic Pilot is exhibited to show that safety appliances apply as well to the air as they do on water and on land. There is also on exhibition one of the latest models of the Curtiss aeroplane engines and propellers.

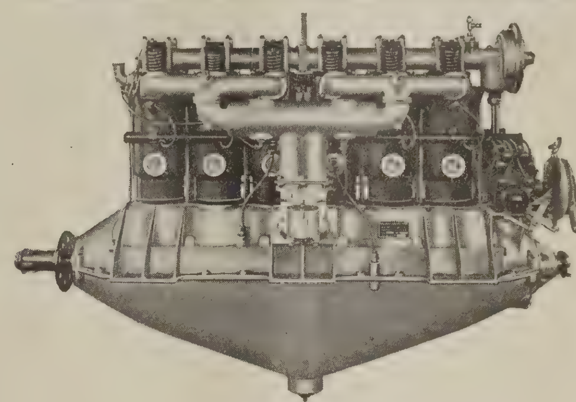
Stevens Ascends from Madison Square Roof

Leo Stevens on Saturday afternoon of last week made an ascension in his balloon, the Bluebird, from the roof of Madison Square Garden in connection with the opening of the First National Motion Picture Exposition. After being in the air about forty-five minutes the aeronaut made a landing at Canarsie. He announced that he had reached an altitude of 10,000 feet.

Grand Rapids Aviation Corps to Start Training

With the Benoist flying boat almost completely rebuilt by installation of a new 100-horse-power motor and recovering of wings, the Grand Rapids Military Aviation corps is nearly ready to begin training. Twenty out of the numerous applicants have been selected to take the course and technical instruction classes will begin some time this week, according to Fred Z. Pantlind, president of the organization.

The technical work will consist of instruction in the mechanics of flying, the history of heavier-than-air machines and gas bags, and in a study of air conditions, as well as a careful study of the construction of an aeroplane. As soon as this work has been completed, eight men will be selected to take the first lessons in practical flying. Work will be carried on at Ramona under the personal supervision of Bud Morris, the professional who is in charge of the school. Ultimately all who are taken into the class will be given instruction in handling the aeroplane.

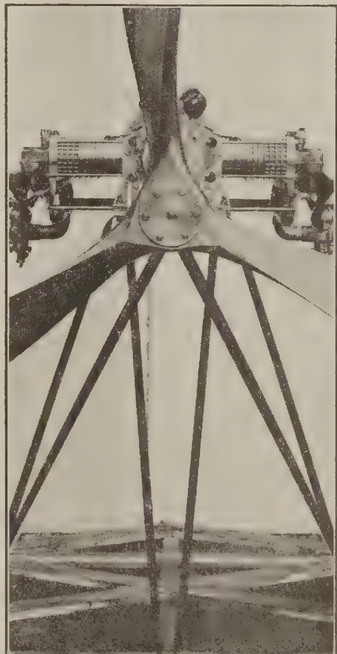


Giant Aeroplane Nearly Ready

The transcontinental triplane, under construction by the C-E Aeroplane Co., at their factory in Anderson, Indiana will shortly be ready for its initial tests. The planes, motors and will be used. This new machine, as stated in our issue of fuselage are now being assembled. Two 140 h.p. Sturtevant engines will be used. This new machine, as stated in our issue of April 10, has a wing spread of 67 feet.

Cylindrical houses each equipped with a seat for one man will inclose each of the motors and there will be a man to attend each motor during a flight. The cabin for passengers and pilots will be in the center of the aeroplane. The lower plane will be bisected by the fuselage, which will be twenty-eight feet long when the rudder is atteched. Two compartments in the cabin will be six feet high and four feet wide.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of AERIAL AGE WEEKLY, published weekly at New York, N. Y., for April 1, 1916. State of New York, County of New York, ss. Before me, a notary public, in and for the State and county aforesaid, personally appeared G. Douglas Wardrop who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Aerial Age Weekly, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Aerial Age Weekly, Inc., 116 West 32nd St., N. Y. C.; Editor, G. Douglas Wardrop, 116 West 32nd St., N. Y. C.; Managing Editor, G. Douglas Wardrop, 116 West 32nd St., N. Y. C.; Business Manager, G. Douglas Wardrop, 116 West 32nd St., N. Y. C.; Asst. Bus. Mgr., G. A. Cavanagh, 116 West 32nd St., N. Y. C. 2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) Aerial Age Weekly, Inc., 116 West 32nd St., N. Y. C.; Henry Woodhouse, 297 Madison Ave., N. Y. C.; W. D. Moffat, 119 West 31st St., N. Y. C.; W. I. Seaman, 20 Exchange Pl., N. Y. C.; J. H. Coit, 119 West 31st St., N. Y. C.; L. D. Gardner, 119 West 31st St., N. Y. C.; G. D. Wardrop, 116 West 32nd St., N. Y. C. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ...... (This information is required from daily publications only.) G. Douglas Wardrop, Business Manager. Sworn to and subscribed before me this first day of April, 1916. (Seal) Elise Gilman, Notary Public, Westchester County. (My commission expires March 30, 1917.)



AERIAL AGE
WEEKLY

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Transcontinental Aeroplane Competition to be Held This Fall—Ralph Pulitzer Offers Trophy—$20,000 First Prize—Over $100,000 in Other Prizes

TO develop our aerial defenses the Executive Committee of the Aero Club of America has decided to hold a Transcontinental Aeroplane Competition, with a first prize of $20,000 and a possible total of over $100,000 in prizes and a splendid trophy offered for annual competition by Mr. Ralph Pulitzer, the owner of the New York *World*.

The plans to hold this Transcontinental Aeroplane Competition, which have been developed by the aeronautical authorities after lengthy consideration of the aeronautical needs of the country, was started as a result of Mr. Pulitzer's offering the trophy for annual competition.

Mr. Pulitzer, who recently was in Europe and while there made flights over the fighting lines with military aviators, and saw the tremendous development of aeronautics in Europe, finding our aerial defenses in a pitiful condition, after giving thorough consideration to the aeronautic situation in America, arrived at the conclusions given in the following letter sent by him to Mr. Alan R. Hawley, President of the Aero Club of America.

Mr. Pulitzer's letter follows:

"Dear Mr. Hawley:

"My visit last Summer to two of the armies which are fighting on the Western front gave me an exceptionally vivid realization of the vast importance of the air service for national defense.

"War is, of course, a marvelous creator as well as destroyer, and in the warring nations the development of military aeronautics has been and continues to be, as you well know, quite incredible. I may say without any great exaggeration that taking into consideration all the phases of aeronautics each month of war has with those nations meant the advancement of a year of peace.

"The reflex stimulus of the war has induced a very remarkable progress in design and construction in this country. But aviation as a whole has stagnated.

"We, as a people, are trying to follow a royal road to learning, waiting until, having skipped all the intermediate experimental types, and having saved the 'waste' of evolutionary mistakes, we can at the end of the war adopt the full-fledged aeroplane that will have been perfected by all the lessons of the war.

"If we follow this theory we shall undoubtedly save money and effort, but what shall we sacrifice in the experience and traditions of the air?

"In the meanwhile, France and Great Britain have over three thousand licensed aviators each, every one of these being allowed three aeroplanes. We have, I am informed, less than fifty trained military and thirty naval aviators, and of our two hundred civilians licensed pilots only about a dozen have made cross-country flights of one hundred miles, and not one has had military training.

"It seems the irony of fate that the country of Langley, the Wrights, Curtiss and other pioneers who may be said to have given the world wings lags last where it ought to be first.

"I have given some consideration to the matter of fostering the development of American aviators, and the following appears to me to be reasonable conclusions:

"1. This country is not a military country. Its instinct will always be to restrict standing military establishments and to rely on trained citizen reserves. This will apply to all branches of the army, including aviation corps. There is thus little prospect of getting from the army the number of officers and men required to form an adequate air service. If, as is the fact, we must have available for our aerial defense in the next five years aviators not in the hundreds but in the thousands, we shall have to depend upon volunteer reserves. The work of the Aero Club of America and affiliated Aero Clubs, and the results attained through the National Aeroplane Fund, which has made it possible for thirty States to take steps to organize aviation sections in the Militia; the bill introduced in Congress to admit civilian aviators in the efforts made to introduce the use of aeroplanes for mail carrying, are all good steps in the right direction.

"2. It is undoubtedly true that a thousand aeroplanes in use for such purposes as sport, mail and express carrying, Coast Guard and life-saving service, and in the Militia would insure a highly valuable process of selection and elimination anal consequent development in the science of aeroplane construction; and an invaluable spread of experience and expertness in aeroplane operation.

"No peaceful stimulus that we can devise will produce the feverish progress in flying machines and flying soldiers that the hothouse of war has forced in Europe. The nearest substitute for the life or death emergency of battle is the win or lose emulation of sport.

"I believe that with sport coinciding with patriotic purpose, a proper inducement to encourage cross-country flying will stimulate a movement which within a short time will train aviators, evolve types of aeroplanes suitable for everyday purposes, and will cause the establishing of permanent landing stations throughout the country, which will do for aviation as much as good roads did for automobiling.

"3. The thing to be done, it seems to me, is to hold an annual aeroplane competition for flying across country. If possible, there should be a transcontinental aeroplane competition, in which sportsmen, military and civilian aviators can participate. This should be done this year, if possible.

"Being anxious to contribute my share towards the important work to be done to make the United States first in aeronautics, I take pleasure in offering, through the Aero Club of America, a suitable silver trophy to be competed for annually under rules and conditions to be drawn by the Contest Committee of the Aero Club of America, said rules and conditions to be progressive, in accordance with the progress made in aeronautics.

"Kindly advise me at your convenience whether your Contest Committee considers it possible to hold a long-distance cross-country competition this year.

"Yours very sincerely,

"RALPH PULITZER."

The aeronautical authorities, agreeing perfectly with Mr. Pulitzer's conclusions and appreciating the tremendous possibilities to develop our aerial defenses which this Transcontinental Aeroplane Competition affords, decided to set aside $20,000 to be awarded as a first prize and to take steps to secure other substantial prizes.

The decision of the Executive Board of the Aero Club of America, with its opinion of the tremendous developments which this Competition may bring forth, are included in this letter addressed to Mr. Pulitzer and signed by President Hawley:

"My Dear Mr. Pulitzer:

"I beg to acknowledge the receipt of your constructive and instructive letter of May 2d, in which you so aptly point out the aeronautical needs of the country and very generously offer a suitable silver trophy for annual competition, with a view of fostering cross-country flying, training of aviators for national defense, sport and utilitarian purposes.

"This liberal offer opens tremendous possibilities, and in thanking you for it and in expressing our hearty appreciation and assuring you of our fullest co-operation, we beg to be allowed to give you an idea of how much we believe this trophy will do immediately to foster the development of American aeronautics.

"We believe that there can successfully be held a Transcontinental Aeroplane Competition this year, and that such a competition will result in:

"(1) Inducing civilian and militia aviators to train and equip themselves, and form a reserve of trained aviators which may be needed in the not distant future to protect our small army in Mexico and Americans living along the Mexican border.

"(2) Break in and train civilian aviators for the Army. Secretary of War Baker has advised the Aero Club that he is in favor of admitting civilian aviators in the Army.

"(3) Form a body of trained aviators which, in case of war, could inspect and protect the railways while the nation's military resources are transported from different parts of the country to the center of distribution.

"(4) Demonstrate to the people of this country the value of aeroplanes and emphasize the necessity of larger appropriations for the Army, Navy, Militia Coast Guard, and Post Office.

"(5) Establish a permanent Transcontinental Aerial highway with landing stations at intervals of between 20 and 50 miles, which will popularize aerial touring as well as give the nation a new, unobstructed highway invaluable for national defense.

"(6) Afford a supreme test of American aeroplanes and motors and bring out the best types."

"Therefore, the Contest Committee of the Aero Club of America recommends that the first competition for your trophy to be made a Transcontinental Competition, the route to be selected after consideration of the various factors which go to making such a competition a success.

"Appreciating the fundamental value of successfully holding such a competition, the Executive Board of the Aero Club of America, which has charge of the National Aeroplane Fund, has decided to set aside $20,000 from the National Aeroplane Fund to be offered as first prize, to be awarded to the aviator making the best time in the Transcontinental Competition.

"The value of the Transcontinental Competition will be thoroughly appreciated by the country at large and we can rest assured of the co-operation of the numerous organizations which are now co-operating with the Aero Club of America to develop aeronautics for national defense and to establish permanent landing stations for aeroplanes. These include 27 affiliated aero clubs, the National Guard and Naval Militia of every State, Chambers of Commerce, cities, the Lincoln Highway Association, National Highway Association, patriotic organizations and thousands of representative men and women.

"The success of the National Aeroplane Fund, which in ten months has made it possible to take the first steps toward organizing aviation sections in the Militia of thirty States, shows that the public realizes the necessity of developing reserves of trained aviators to make up for the serious deficiency in this respect of the Army and Navy, which, if the measures being considered in Congress are adopted, will not have even 200 trained aviators, combined, by June 30, 1917.

"Cities and organizations along the route to be followed by the aviators, as well as individuals, will be invited to offer prizes. We are now awaiting word from a city on the Pacific Coast which may offer $20,000 to make that city the terminus of the race. Other cities will offer between $5,000 and $10,000 for prizes so as to be made 'controls' where the aviators will stop twelve hours.

"Whereas, the route selected for the Competition may be adopted as part of the permanent aerial highway across the continent, for which there will be established landing places at intervals of between 20 and 50 miles, the most progressive cities will realize the opportunity afforded to establish permanent aeroplane stations in their localities and will give substantial co-operation to make this competition a success. As aeroplanes are now safe the establishing of such a chain of landing stations across the continent will make aerial touring popular, just as the advent of good roads made automobiling popular.

"When it becomes known that there are about twenty controls to be established and that any city, organization or individual can, by giving prizes of between $5,000 and $10,000 for this competition, help to establish a permanent Aeroplane station at any one place along the first Transcontinental Aerial Highway, there will probably be more offers than can be accepted.

"The Contest Committee proposes, therefore, that decision as to the route to be followed be postponed until the plan is made known and the Committee hears from cities, organizations, and individuals who may wish to co-operate. The end of August is suggested as the date of the start of the Competition.

"We hope that our appeal for prizes will bring such response that prizes can be given, as follows:—

1st Prize	$20,000	5th Prize	$5,000
2nd Prize	15,000	6th Prize	2,500
3rd Prize	10,000	7th Prize	2,000
4th Prize	7,500	8th Prize	1,500

"If to these can be added special prizes for best time made between large cities, mail carrying, longest sustained flights made, best demonstration of utilitarian value of aeroplane; best demonstration of military value of aeroplane, and other similar purposes, the total amount will be so substantial that the Militia of every State and organizations co-operating will enter well equipped aviators in the competition and use the prizes to build their aviation detachments.

"Considering that there are about 50 trained aviators, 50 civilian and Militia aviators being trained and that there will be as many more trained during the coming two months; and, further, that there are about 150 aviators who took their pilot's licenses in the past two years, but have not kept up their training, owing to lack of inducements and opportunity, we may expect as many as forty to fifty aviators.

"If substantial prizes are offered, the Competition will induce aviators to immediately train and equip themselves with the best of aeroplanes, and to study the routes along the continent and along the Mexican border, so that, if the need arises in the immediate future, they will be able to render valuable services in Mexico.

"The Contest Committee considers this Competition the most stupendous project proposed so far for the purpose of advancing both the cause of national defense and American aeronautics in general.

"Those of us who have been connected with the development of aeronautics since the early days recall with a feeling of hearty appreciation the substantial inducements offered in the past of the New York *World* to foster the development of this young art and science. We well remember that:

"On Jan. 31, 1909, in anticipation of the Hudson-Fulton celebration, the *World* offered $10,000 for the first flight between Albany and New York. The offer was good until, October 10, and Captain Thomas S. Baldwin and George T. Tomlinson tried and failed to win the prize. The *World*, very sportsmanlike, extended the offer for a year, and on Sunday, May 29, 1910, Glenn H. Curtiss won the prize, covering the 137 miles in 152 minutes.

"In June, 1910, the *World* arranged for Glenn H. Curtiss to drop bombs from an aeroplane on the figure of a battleship on Lake Kuka, New York. This experiment, entirely successful, furnished the first demonstration of the possibilities of aeroplanes in warfare. Pursuant to the *World's* suggestion that aeroplanes should be utilized as naval auxiliaries, on November 14, 1910, Eugene B. Ely flew from the deck of the U. S. battleship five miles to shore at Hampton Roads.

"On July 16, 1910, the *World* and the St. Louis *Post-Dispatch* jointly offered $30,000 for the first flight between New York and St. Louis, in either direction, between August 15 and December 31 of that year. The flight was to be made within 100 consecutive hours, a condition which contestants failed to meet.

"This is a remarkable record, of which the *World* can be very proud. Few newspapers, and, likewise, few individuals and organizations had faith in aeronautics in those days.

Those men who co-operate in making this competition a success will feel as gratified, in a few years, as we feel when when we look back to only a few years ago.

"It is a fact that when the problems of immediately improving the national defenses are considered there is found that aeronautics affords possibilities for quick developments and immediate relief at only a fraction of the cost of developing other arms. 'Of all the weapons produced by this war, the aeroplane is the most efficient. It protects, it destroys, it fights. It is the super spy, super scout, super belligerent.' It is also a fact that greater developments can be brought about in aeronautics for a given investment of time or money than in any other line of human endeavor. With five thousand trained aviators, this country would be in the safe position of the porcupine, which goes about its daily pursuits, harms no one, but is ever ready to defend itself.

"Again thanking you, on behalf of the aeronautic movement for your substantial support, and assuring you of our hearty co-operation to make the Transcontinental Competition a success, we beg to remain,

"Cordially yours,

"THE AERO CLUB OF AMERICA,

"ALAN R. HAWLEY, *President.*"

Printer's Devil, Holding That Secretary Baker's Estimate for Army Aeronautics Is "Too Small For Anything," Declines to Correct Figures—Nominates "Teddy."

The printer's devil's viewpoint on any really serious question is valuable. He represents a class that is not obsessed with the fine points in political life which come up particularly when a presidential election is near. He believes that if the other fellow hits you with a club, that is evidence enough that he means trouble, and knows instinctively that there are only two things to be done: one is get a club and compel the other fellow's respect; the other is—run for your life. The printer's devil, not being versed in politics, would not stand to be hit again and again—and again and once more—and still hold that the other fellow does not mean it. Nor would he, while parleying with the other fellow, who hit him with a club, refuse to take any club available to compel the other fellow's respect.

The foregoing explains why the printer's devil refused to correct the figures regarding Secretary Baker's estimate of the aeronautical needs of the Army which we published in the last number of AERIAL AGE. Secretary Baker's estimate is $1,785,000 for the entire Signal Corps, part of it to go for aviation. It was "set up" as $1,000,000 and the editors corrected it on the proofs. But the printer's devil said it was *"too small for anything,"* and refused to correct it. He says that if he had all the money that Uncle Sam has he'd "have the biggest air fleet in the world in no time!"

Our printer's devil is a real American and we rather believe that if he is found out he'll be nominated as delegate to the next convention. We asked him what he would do if he were in a position to select a candidate for the presidency and he said that he would select "Teddy" Roosevelt—"then we'd get all the aeroplanes we need for the defense of our country."

This reminds us that a Roosevelt Administration, in 1907, at a time when aeroplanes were not yet publicly known to be capable of flight, with remarkable foresight and progressiveness, drew the specifications for an aeroplane, and gave the United States Army an aeroplane—two years before any other country took a similar step.

One who looks for a solution to the problem of organizing the air service needed for national defense finds that the only hope lies in another Roosevelt Administration.

P. S.—Secretary Baker has boys of his own and he will understand when he thinks this over that he owes it to them to think of the future. If he will only submit the question to them he will get a quick verdict for at least $5,000,000 for army aeronautics.

Administration Expresses High Praises of Transcontinental Flight

From Newton D. Baker, Secretary of War:

"It is true that aviation is in its infancy in this country, although it was born here. Every project such as the ambitious one outlined in the *World* today is certain to prove beneficial in stimulating interest in the subject. I can only express my delight that Mr. Pulitzer has devised the aerial Derby. The offer which he and those associated with him in the project have made is certain to result in great good from a civil as well as a military standpoint."

From Brig. Gen. George P. Scriven, Chief Signal Officer of the Army:

"The idea is an excellent one. While there is ground to believe that an attempt to fly across the ocean in a heavier-than-air machine would be folly, there is no reason why a cross-country contest should not be held. It undoubtedly will greatly stimulate interest in aeroplane construction and in flying. The great difficulty which we have encountered has been in the motor. There has been gradual improvement and a motor has recently been developed which contains much of promise. Anything that promises practical results is of value and the projected contest should furnish a demonstration of what modern American aeroplanes can do."

From Rear Admiral W. S. Benson, Chief of Operators of the Navy:

"Anything that will stimulate interest and tend to improve aircraft and aviation would be of very great value. The greatest trouble has been to develop motors that will do the work satisfactorily. A contest like the one proposed will stimulate interest and should result in good. It will be especially valuable as a demonstration of what can be done in the way of land flying, but any improvement in construction and operation will be of great value in the navy, where conditions are very different."

From Josephus Daniels, Secretary of the Navy:

"The proposed aviation classic will stimulate an interest in aircraft and flying which is greatly needed. While the United States is the birth-place of aviation the art is still in its infancy here. While both the army and navy have made great progress during the past year, the stimulation of such a contest and the incentive offered by the *World* will make the people take an interest in perfecting and operating aircraft. The stimulation will have its value not alone in the promotion of aviation as a science, but also in perfecting this new arm of the naval and military departments of the Government and the utilization of flying machines in other lines of public and private endeavor."

The News of the Week

Peary on Air Defense

Rear Admiral Robert E. Peary, speaking last week before the Washington Chamber of Commerce said:

"Let me assemble a few facts with which you are all more or less familiar and then tell you the meaning of those facts.

"Fact No. 1—Recently Aviator Thompson flew over Washington, dropping imitation bombs where he pleased.

"Fact No. 2—A few weeks ago Stephen MacGordon, one of our able young aviators, flew with a passenger from Newport News to Washington and return in a little over five hours.

"Fact No. 3—If the air line distance from Newport News to Washington is laid out due east from Washington, the other end of the line will be forty miles off shore at Cape Henlopen.

"Fact No. 4—During the past few months three steamers have entered Hampton Roads without the slightest hint or news of their coming being known until they poked their noses inside the capes.

"Fact No. 5—The smallest of these three steamers, the Appam, could easily carry a squadron (twelve) of up-to-date aeroplanes.

"What do these facts mean? They mean this: That Washington is just as accessible to an air raid as Boston, New York, Norfolk, Charleston or Savannah or any of our seacoast cities.

"It means that any one of several European countries by issuing an order to-day could two weeks from to-day inflict damage upon this city greater than the entire cost of a suitable air service for this country and could repeat here the scenes of horror, destruction and loss of life that have already been enacted in the cities of the east coast of England."

New York to See Air Battle

New Yorkers will see the first battle in the air ever fought in this country on May 21st. A hostile aeroplane will drop explosive bombs on a number of buildings. The United States forces, with an anti-aircraft gun mounted on an armored automobile, will bring it down from the clouds. Other aeroplanes will go to the rescue of the wounded flier and bombs and machine guns from aloft will battle with rifles and artillery from the ground.

It won't be the real thing, of course, but a realistic portrayal of it at the aviation and military tournament at Sheepshead Bay. The plans for the week were given out and final arrangements in the shape of a bank guarantee for $10,000 in prizes on the part of Harry S. Harkness were announced as having been made.

Export of Aeroplanes

Exports of aeroplanes and parts for the week of May 8th were as follows: To England, $147,262; to Cuba, $17; to Brazil, $906; total, $148,165.

Naval Militia Aviation Section at Bay Shore

The Aviation Section of the First Battalion, New York Naval Militia, reported at Bay Shore, L. I., on Saturday, May 13th. The Curtiss flying boat was awaiting them and work was begun unloading the machine from the two motor trucks. On Sunday, May 14th, at noon, the town folk were able to see the first flying boat ever assembled at Bay Shore, there being between 200 and 300 visitors at the camp. So much progress was made that by Sunday, May 21st, the first flights will be made. The runway was built, tents pitched and every thing made ready for the flights.

The Aviation Section is fortunate in having enlisted Ensign F. E. Wysong, a designer, formerly with the Curtiss Company, and now with the L. W. F. Aeroplane Company, of Long Island City.

The Second Battalion, New York Naval Militia, is trying to secure a site next to the one of the First Battalion Camp, and should they be successful, they will immediately start preparations to receive the Burgess machine which will be presented in the near future.

More Aviators to the Border

Lieutenants Ralph Royce, John Curry and Roy S. Brown, of the Signal Corps Aviation School at North Island, who recently qualified for the rank of junior military aviator, received orders from the War Department to proceed to Columbus, N. M., to join the First Aero Squadron.

The Accident to the Curtiss H-10

The model H-10, wrecked near Alexandria, Va., on May 10th, was an experimental machine of the "America" type equipped with two 160-h.p. model "VX" motors.

The accident was caused by the breaking of one propeller, pieces of which struck the other propeller, causing it to break also and thus making a quick forced landing necessary from a height of 100 feet. There was a strong wind blowing and one wing struck the water first, which, together with the speed at which the machine was moving, probably over 100 miles per hour, caused the craft to spin about and strike broadside causing its complete wreck.

None of the five men on board was wearing a life preserver. A tug nearby rescued the three men who were in sight and, assuming that there were no more on board, steamed away. When one of the three sufficiently recovered from the shock to tell the captain of the tug that there were two others, the tug returned but was unable to locate them.

The men lost were: Mr. Louis Crants, Hammondsport, N. Y.; Mr. Charles A. Good, Elyria, Ohio.

Those rescued were: Mr. Theodore Macaulay, Newport News, Va.; Mr. Philip Utter, Cleveland, Ohio; Mr. Mayo, Dudley, newspaperman.

None of the latter is seriously injured and all are rapidly recovering.

The Gallaudet Seaplane, U. S. Navy type, equipped with two Duesenberg 150 h.p. motors which has a radius of 4 hours at 100 m.p.h.—two engines running, or 11½ hours at 70 m.p.h. one engine running

Christofferson Motor Corporation Incorporated

The Christofferson Motor Corporation, with temporary offices at 61 Broadway, has recently incorporated under the laws of New York State, for the purpose of exploiting and developing the Christofferson aircraft motors, one of the models of which was described in our issue of

The officers of the company are as follows: President, Lansing K. Tevis; secretary and treasurer, W. S. Bacon; directors, Lansing K. Tevis, W. S. Bacon, Elwood M. Rabenold, John LeRoy Glover and Richard Lounsbery.

The new corporation has acquired the engine interests of the Christofferson Aircraft Mfg. Co., of San Francisco, Cal. Mr. Silas Christofferson has been retained for a period of years as head of the corps of engineers.

All of the engine laboratory work will be continued at Oakland, for the next six or eight months. It is expected that the new Christofferson twin-six will receive its initial block tests within the next two months.

Aerial Program at Sheepshead

An elaborate program has been arranged for the opening day of the National Guard maneuvers at Sheepshead. After the investment of the grounds by the National Guard there will be a great aerial demonstration. An aeroplane, while attempting to drop "bombs" on several buildings, will be chased and fired upon by armored motor cars and by two anti-aircraft guns mounted on the ground of the Sheepshead Bay Speedway.

The "hostile" aeroplane will be brought to earth, and another aircraft will land in an attempt to pick up the "damaged" craft and "injured" pilot. When the armored cars crowd in upon the two aircraft the latter will open fire on them with their aeroplane guns, while several more "hostile" aeroplanes appear and drop "bombs" on the armored motor cars.

Bjorklund over Preparedness Parade

Over the throngs gathered at the lower end of the city and over the paraders marching north from that section a military biplane from Governor's Island buzzed throughout the forenoon hours, at times whizzing downward from a dizzy height, then soaring upward until a mere speck in the blue.

The demonstration was arranged by the Army Aviation Corps, and those who witnessed it realized what Parisians must have felt when the German Taubes were sailing over the French capital and dropping bombs upon its streets.

The pilot was Bjorklund. He had with him one of the students who are being trained on Governor's Island for the Aviation Corps.

Col. Squier Arrives

Lieutenant Colonel George O. Squier, for four years military attache of the American Embassy in London, arrived on board the American liner Philadelphia to assume command of the aviation service of the United States Army. He succeeds Lieutenant Colonel Samuel Reber.

With Colonel Squier on the Philadelphia was L. J. Seeley, European representative of Glenn H. Curtiss.

Mr. Lansing K. Tevis, president of the newly incorporated Christofferson Motor Corporation

Personal Paragraphs

Don McGee, who has a hangar and 100 horsepower Curtiss biplane at Saginaw, Michigan, has recently been entertaining the residents of his city with short speedy flights. He is preparing for the exhibition season.

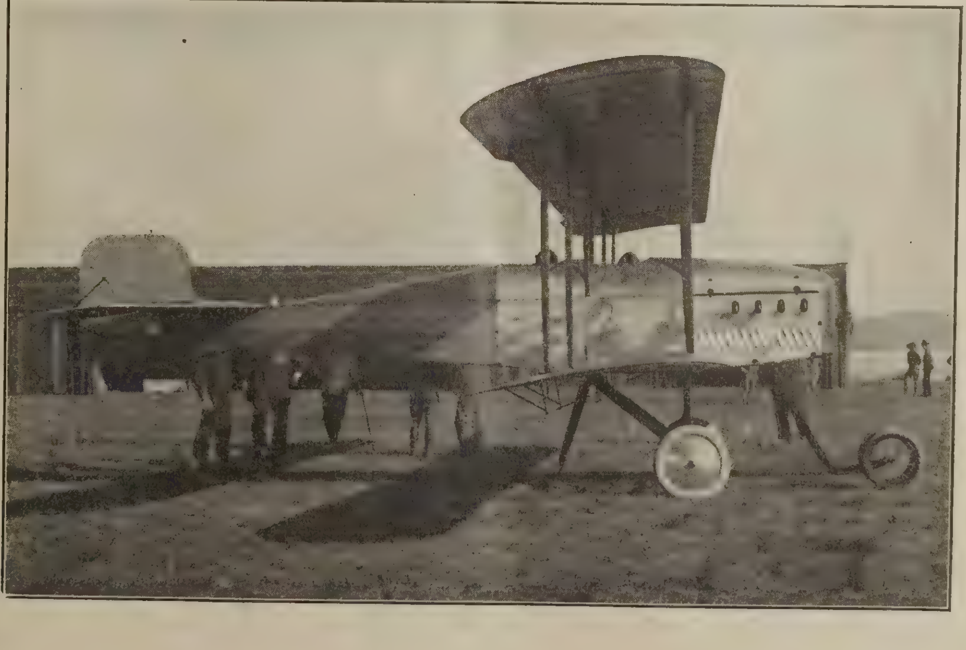
Charles Boehnlein, and L. E. Barrett, of Minneapolis, have been appointed temporary chairman and secretary, respectively, of the new Aero Club of Minnesota.

So impressed was the Japanese correspondent of the New York *Sun* with the recent gyrations of Art Smith that he gave forth the following: "The wind god exhausted his stock in the vain attempt to remove the intruder from his realm. He stands open-mouthed at his own powerlessness."

Paul Rohrer, son of Fred Rohrer, publisher of the Berne *Witness,* is building an aeroplane at Berne, and expects to give flights during the coming season. He took lessons last summer at an aviation school at Cicero, Ill., and came home and began work on an aeroplane of his own design. He will make his trial flights in the country near Berne.

Boleslaw Warchalowski, of Herkimer, N. Y., has secured a patent on the design of an aeroplane. The machine comprises a number of original ideas, a principal one being that of horizontal stabilizing propellers at each side.

The Glenn L. Martin military tractor biplane, equipped with Hall-Scott motor, of the type used at the U. S. Army training school at North Island, San Diego



Aviation in the Coast Guard Service

On May 11 Congressman Ransdell introduced the following Bill to provide for aviation in the Coast Guard:

A BILL

To provide for aviation in the Coast Guard.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of saving life and property along the coasts of the United States and at sea contiguous thereto, and to assist in the national defense, the Secretary of the Treasury is authorized to establish, equip, and maintain aviation stations, not exceeding ten in number, at such points on the Atlantic and Pacific Coasts, the Gulf of Mexico, and the Great Lakes as he may deem advisable, and to detail for aviation duty in connection therewith officers and enlisted men of the United States Coast Guard. At one of these stations there may be instituted a school for the purpose of special instruction in aeronautics, and the Secretary of the Treasury is hereby authorized to employ one expert instructor in aeronautics, at a salary of $4,000 per annum, and one assistant instructor, also skilled in aeronautics, at a salary of $3,000 per annum.

At the request of the Secretary of the Treasury the Secretaries of War and Navy are authorized to receive officers and enlisted men of the Coast Guard for instruction in aviation at any aviation school maintained by the Army and Navy, and such officers and enlisted men shall be subject to the regulations governing such schools.

Hereafter officers and enlisted men of the Coast Guard, when detailed for aviation duty, shall receive the same percentage of increases in pay and allowances as are now or may hereafter be prescribed by law for officers and men of the Navy detailed for aviation duty: *Provided,* That no more than a yearly average of fifteen commissioned officers and a total of forty warrant officers and enlisted men of the Coast Guard detailed for duty involving actual flying in air craft shall receive any increase in pay or allowances by reason of such detail or duty: *Provided further,* That the number of third lieutenants and third lieutenants of engineers now authorized by law for the Coast Guard is hereby increased ten and five, respectively; and such portion of the Act approved August twenty-fourth, nineteen hundred and twelve, which provides that no additional appointments as cadets or cadet engineers shall be made in the Revenue-Cutter Service unless hereafter authorized by Congress is hereby revoked.

Sturtevant News

Recent tests conducted on the B. F. Sturtevant Co.'s Improved Model 5, 140 h.p. aeronautical motor indicate that this engine is one of the most efficient, reliable and highly developed aeronautical motors of its type produced at the present time.

The large amount of experience and data that has been accumulated during the past five years or more that the B. F. Sturtevant Company has been manufacturing high speed engines, both aeronautical and marine, have been carefully segregated and crystallized into certain definite features that have been incorporated in the improved 140 h.p. motor.

The high grade alloy steels used in the construction of these motors are subjected to special heat treatments that have been accurately determined as a result of exhaustive experiments. These heat treatments have made possible a great increase in the tensile strength of the various steels employed as well as reducing the weight of the parts, although in no case has the necessary strength been sacrificed for this purpose.

All of the castings used on the motors are produced in the B. F. Sturtevant Co.'s own foundry. Incidentally, the Sturtevant Co. are recognized experts in aluminum foundry work.

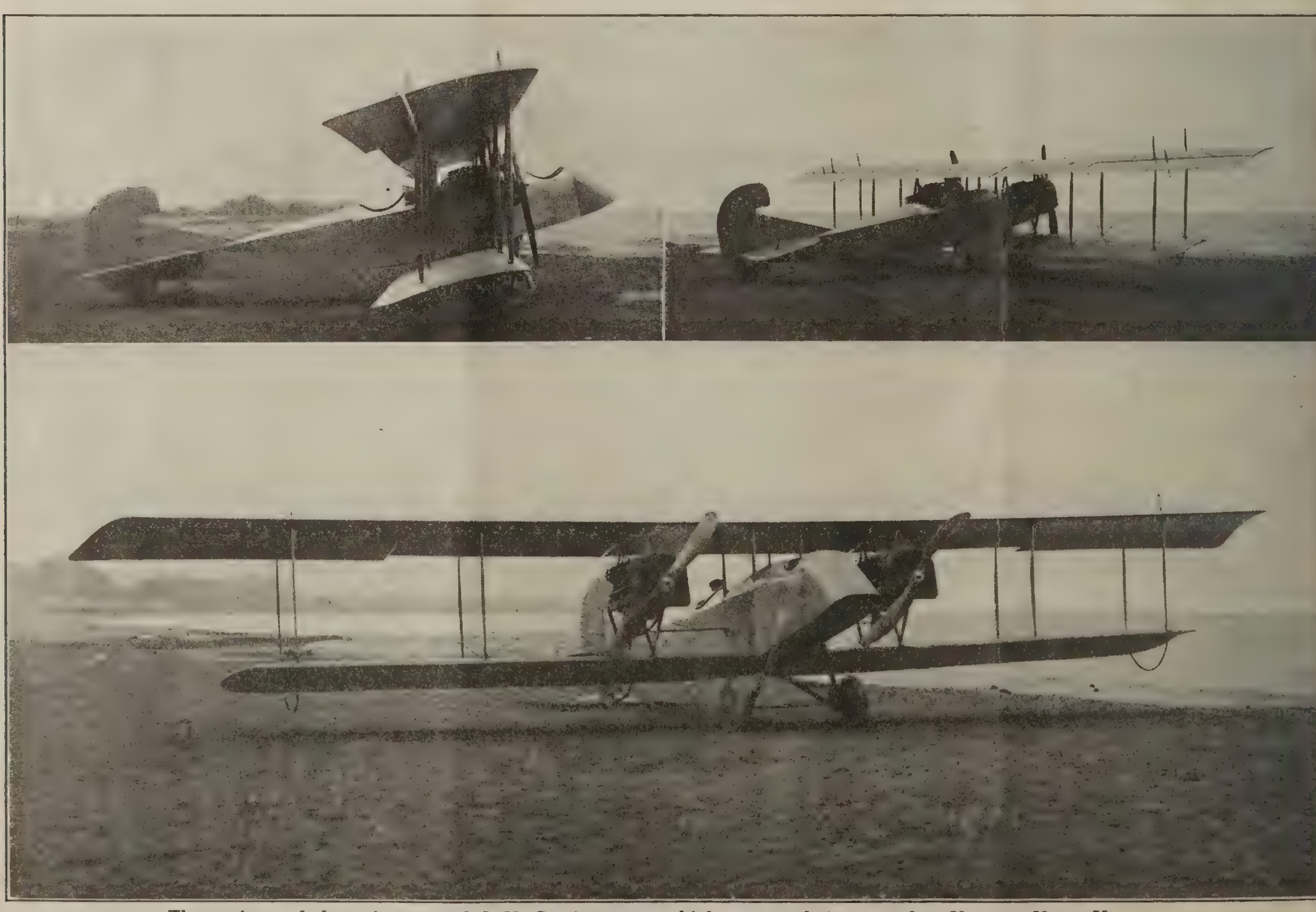
A ten-hour continuous run was recently conducted on one of the U. S. Navy motors at Hyde Park. The average horsepower developed during the test at 2,000 r.p.m. was 141. On the following day a brake horsepower test was run off on the same motor, the latter developing 145 h.p. at 2,025 r.p.m. Upon completion of the test the engine was dissembled for inspection. With the exception of two exhaust valves which showed a slight indication of leakage, thus accounting for the somewhat lower horsepower developed, the various parts revealed no excessive wear.

The above tests were witnessed by Mr. F. B. Conway, the U. S. Navy Inspector of Aeronautical Material.

Adjt.-General Logan Advocates Aerial Corps

Adjutant General Logan feels that the Iowa guard should have an aerial corps, but there is no way in which the equipment could be secured unless the War Department should arrange to provide the machines. Each operator should have at least two machines, he believes.

A local movement has been started to supply this equipment.



Three views of the twin-motored J. N. Curtiss tractor biplane, now being tested at Newport News, Va.

AERIAL EXHIBITS AT GRAND CENTRAL PALACE

As noticed in the columns of Aerial Age last week, there will be, in connection with the Third National Exposition of the American Museum of Safety, a section of the Grand Central main floor devoted to Preparedness, and in this section aeronautics will be substantially represented. Mr. Arthur Williams, president of the Museum, and Dr. Tolman, its efficient Director-General, expect this year's exposition to eclipse any hitherto held, in point of general interest and timeliness.

In the aerial section the Aero Club of America will have a reception room, where literature, calling the attention of the visitors, to need for aerial preparedness will be distributed. Many of the aviation trophies will be displayed, as well as a peculiarly interesting assortment of pictures of historic significance.

Flying, the official organ of the Aero Club of America will have a booth, as will also Aerial Age.

The Aeronautic Plane & Motor Co. will have one of their latest model direct six-cylinder motors on hand, and Mr. Harry B. Wise, salesmanager, will be glad to explain its characteristics to all interested.

The Christofferson aircraft engine, which recently went through a public test at the Automobile Club, will be exhibited, and Mr. Lansing K. Tevis, president of the Christofferson Motor Corporation, which has just acquired the Christofferson engine properties, will be glad to give complete information concerning his engine.

There will be a very complete display of instruments, the Foxboro Co., The Veeder Co., Henry J. Green, and A. Hautstetter contributing different units.

One of the most interesting exhibits will be the L. W. F. tractor biplane, described elsewhere in this issue, which will be suspended from the ceiling.

On account of the tremendous pressure of business a large number of the companies only find it possible to be represented photographically. These include the Curtiss Companies, the Burgess Co., the Wright Co., the Sturtevant Aeroplane Co., the C-E Aeroplane Co., the Thomas Aeroplane Co., the Roberts Motor Mfg. Co.

The General Acoustic Co. will demonstrate one of their Aviaphones, the Ericcson Company one of their Berling magnetos, the Norma Ball Bearing Co. a working model of their ball bearings, the Ideal Wheel Co., some of their special wheels.

The exhibition will last from May 22 to 29 and any readers of Aerial Age who desire to attend may acquire tickets of admission by mailing us a post card.

AVIATION IN THE CALIFORNIA CITIZENS' TRAINING CAMP

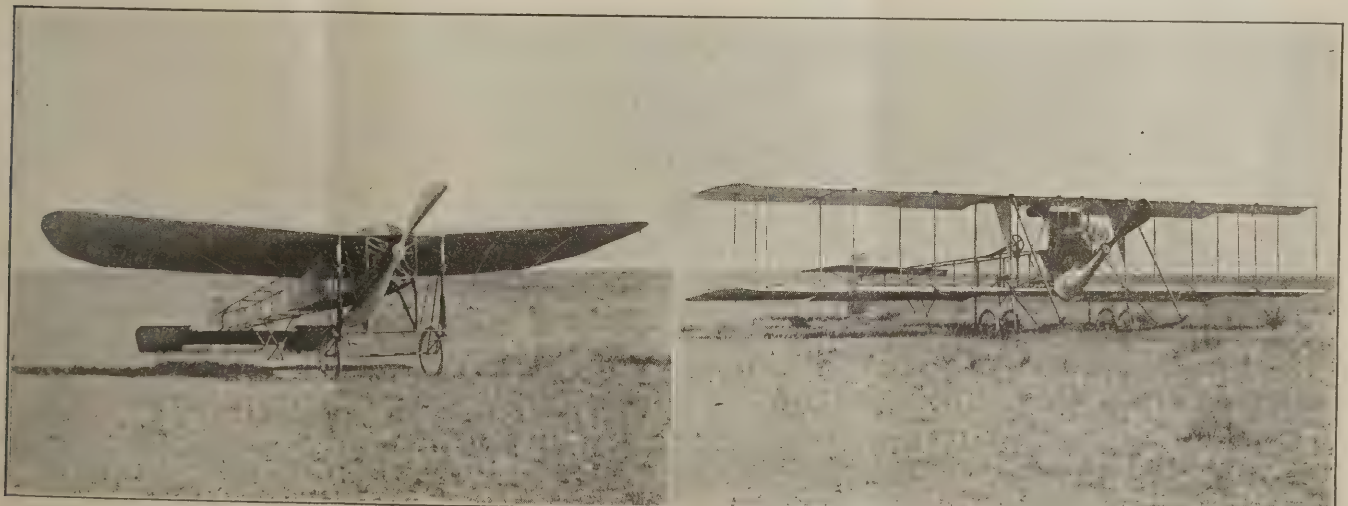
Men attending the citizens' training camp at Monterey, Cal., this summer are to be taught practical military aviation, if an offer of the Aeronautical Society of California to provide two aeroplanes with expert aviators and mechanics for use at the camp is accepted by Maj.-Gen. J. Franklin Bell. That the offer will be accepted is thought to be assured, since Col. Frederick Perkins, chief of the Bureau of Militia Affairs of this division, under whose direction the camp will be maintained, has given enthusiastic support to the project.

A formal tender of the machines has been made. The Society offers to assume transportation expenses, aviators' and mechanics' salaries, breakage and fuel and operating expenses. All that is requested from the Government is tentage or some other suitable shelter for the machines.

The two machines which it is proposed to send to the camp are owned by Earle Remington, president of the society. They are at Venice at present being thoroughly overhauled and remodeled at his expense. Mr. Remington states that he will stand all damage to the machines. One of the aeroplanes is the Gnome-Bleriot racing monoplane which was built for the Gordon Bennett race in New York in 1912, and for eighteen months held the record for speed, being driven on one occasion at a rate in excess of 107 miles per hour.

The second machine is a passenger-carrying biplane, designed by Mr. Remington and built by Beryl Williams. It is expected that Mr. Williams, who recently returned from the Orient, where he was instructing the Chinese revolutionists in the art of flying, will pilot the aeroplane during the Monterey encampment. As yet no pilot has been named to drive the monoplane.

It is the intention of the Aeronautical Society of California to give instruction in flying to as many men as may be designated by the camp authorities. As yet no detailed plan has been made, but it is suggested that aeronautics be included in the study of at least a detachment of the civilian campers.



THE L-W-F MODEL V TRACTOR BIPLANE

JUDGING from the pleasing designs of the Model V, L-W-F Engineering Company's military tractor biplane, the new machine should prove one of the most successful types in this country. In refinement of detail it is particularly interesting, while very extended consideration has been given to the standardization of all parts, and to putting the various members through the most rigid tests prior to assembly.

The firm comprises an excellent combination of aeronautical experts. Robert G. Fowler is the aviator who flew from Los Angeles to the Atlantic Coast in a Model B Wright machine and was the first man to fly over the Isthmus of Panama. Charles F. Willard is one of the pioneer airmen, having gone on an exhibition flying tour with a Curtiss machine as far back as 1908.

General Specifications, Model V.

Motor—This model is equipped with 135 h.p. Thomas aeromotor.

Surface—Four hundred and ninety square feet.

Spread—Upper surface, 46.5; lower surface, 38.6.

Body, Fuselage—The body construction is a special feature. Three plies of extra selected wood are used and between each ply is a layer of silk which has been chemically treated, so that when the cement is applied, the laminations are thoroughly bound together.

One ply of wood runs longitudinally, while of the other two one is spiraled to the right and the other to the left.

This whole shell is then covered with a specially prepared fabric. In the case of water machines, hydroaeroplanes, the body is stitched through and through with fine extra strong wire, which eliminates any possibility of separating the different plies from exposure. The body is carefully treated with several coats of waterproof preparation and over this from two to four coats of spar varnish.

The pilots are free from any possible damage from long splinters in the event of a bad landing, as the silk and spiral construction tend to eliminate such fractures. If a forced landing should be necessary in trees or shrubs, from experience, we believe that no serious injury would befall the pilot or passengers, as the danger of being pierced by small limbs would be entirely eliminated by the wooden body.

Two comfortably upholstered seats, arranged in tandem are provided in this body.

Control—Farman or any standard type such as "Dep.," Shoulder Control or L-W-F 3 in 1 is furnished on request.

Landing Gear, Chassis—The landing gear is purely of military design such as has been adopted by the United States and foreign governments and consists of two 26 x 4 pneumatic tired stream-lined wheeels mounted on a nickeled steel tubular axle which latter is attached to the chassis by a series of elastic bands of conventional design.

In addition a three-wheeled landing gear, which is especially designed for sportsmen or instruction purposes with a view of preventing machines from "nosing over" in landing and giving a maximum of safety, is being prepared.

A swiveled tail skid of special design is mounted just in front of the rudder, but free from it. The upper end of the skid as well as the customary elastic shock absorbing devices are housed in the body of the machine, thereby decreasing the head resistance.

Floats or Pontoons—The machine is so designed that a complete water gear may be put on in place of the wheels, etc., in a very short time.

This water gear consists of two main floats carefully designed to take care of alighting on rough water, quick rising and to prevent diving in starting.

A balanced pontoon is placed under the rear of the machine to prevent the same from turning over backwards while on the water. The pontoons are constructed of mahogany or cedar planks with spruce braces and hardwood steam bent ribs.

Wings—The most efficient form of standard wing section has been adopted for this machine, and this surface is so arranged as to give the greatest possible inherent stability to the machine without sacrificing an unreasonable amount of flying capacity. The leading edge of the wing is covered with two-ply wood on the top side as far back as the front beam in order to maintain the correct curve. The beams are of careful design and have been calculated in accordance with good standard engineering.

Cloth—The fabric used varies upon the conditions for which the machines are designed. In this case a specially strong fabric complying with the strength requirements of R. A. F. specifications is used.

The seams are double lapped and sewed with silk, while the cloth is placed on diagonally and sewed to the ribs in such a manner that the top and bottom cloth covering is joined.

This system of sewing has only been in vogue, in this country at least, for a very short time, and while more expensive to the contractor is somewhat superior to the previous system of using tacks, especially on the top side.

Fuel Supply—A fuel supply for five hours is regularly provided in three tanks made of the best dairy tin riveted with copper rivets and soldered.

Stabilizer—The stabilizer is divided and mounted on either side of the body. In design it is of the non-lifting double cambered type. These pieces together with the elevators are quickly detachable from the body.

Propeller—One paragon propeller, designed especially for this machine and the motor thereon, is furnished with each complete machine.

Rudder—The rudder frame is of steel tubing and mounted in the conventional way at the rear of the body.

Mufflers—Exhaust gases are piped away from the motor and discharged beneath the planes, thereby adding greatly to the comfort of the occupants.

Equipment—The regular dashboard equipment consists of an altitude meter which reads to ten thousand feet, a motor speed indicator, rolling and pitching gauges, oil and air pressure gauges when the motor installed requires the same. A speed indicator which tells the speed through the air will be furnished at cost.

Zeppelin Raids at Luna

New York may be able to understand what London feels like during a Zeppelin raid by going to Luna Park. In the Aerial Night Attack a squadron of imitation Zeppelins will keep bombs bursting in air.

Pegoud's Plane to be on Exhibition

An aeroplane, stated to be that in which the famous Pegoud fought some of his many duels with German fliers, will be on exhibition at Grand Central Palace at the "Million Dollar Allied Bazaar," June 3 to 14.

Aero Club of Minnesota

A temporary organization has been effected for an Aero Club of Minnesota, as a result of the interest developed by the local Aviation Section of the National Guard. L. E. Barrett, who was one of the students at Newport News, is the moving spirit, and through his energy three aeroplanes have been offered to the Club for the tuition of Guard students.

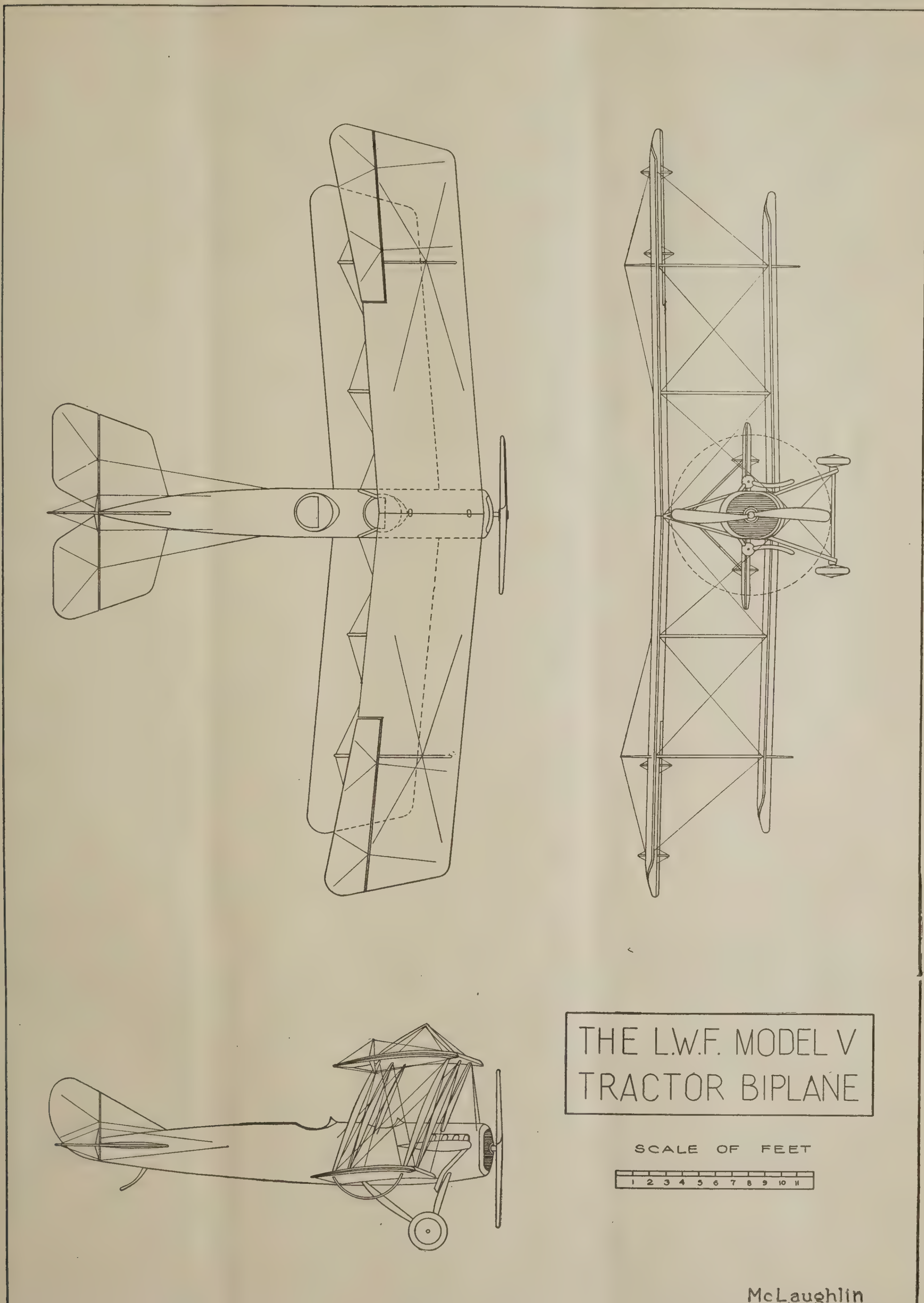
Burgess News

The increasing interest by the militia of the various states in aviation has been strongly indicated by the communications received at the Burgess Company, at Marblehead, Mass. As previously stated in these columns, there is an aviation section of the Massachusetts National Guard busily at work at Marblehead and within the next two weeks a large delegation from New York, headed by Vincent Astor, will receive a demonstration at the Burgess Company's works.

This delegation will be headed by Vincent Astor, who it will be remembered last summer purchased and flew a Burgess-Dunne aeroplane. It is through his efforts largely that the New York National Guard authorities have become interested in this type, and two machines are now under construction at Marblehead for the use of the militia of that state. One of these machines is purchased by the National Guard organization itself, while the other will be the property of Howard S. Borden, the well known sportsman.

In addition to the machines for Massachusetts and New York organizations, the Rhode Island and Maine militia men are also considerably interested and in the near future it is probable that Burgess-Dunne machines will be taken to Providence, R. I., and to Portland, Me., for use by the naval reserves of those states.

Work at the Burgess school during the past two weeks has been greatly hampered by unfavorable weather, extremely high wind velocities being the rule. On May 6, however, in spite of a breeze of 30 miles an hour Aviator Clifford L. Webster in a Burgess-Dunne constructed for the United States Navy, accompanied by T. W. Kerwin, made an extended flight from Marblehead to Salem and return, circulating over the city for half an hour dropping cards.


THE L.W.F. MODEL V
TRACTOR BIPLANE
SCALE OF FEET
1 2 3 4 5 6 7 8 9 10 11
McLaughlin

THE WISCONSIN AERONAUTIC MOTORS

THE Wisconsin Aviation Motors are of the direct drive valve in the head type, with 3-inch valves set on an angle of twenty-five degrees from the vertical and operated by overhead camshafts through rocker arms. The motors have a bore of 5 inches and a stroke of 6½ inches and they are built in both six and twelve cylinders.

The cylinders are cast in pairs, and are set vertical on the six-cylinder motor and inclined on an angle of sixty degrees to each other in the twelve.

The crank cases are well ribbed at the main bearings and substantial bosses are provided for attachment of cylinders.

The crankshafts are of liberal dimensions and run in Fahrig metal-lined bearings. The ball thrust bearing will take thrust from propellers in either direction so the motors can be used on both tractor and pusher type aeroplanes.

The connecting rods on the six-cylinder are of "I" beam section and on the twelve they are tubular. One set of rods on the twelve connects directly with the crankshaft, while the other set connects by means of a hinged joint to the lower end of the first set. This makes a much shorter engine than where both sets of rods are placed side by side on the same crankpin, and a better construction than where one rod is forked and the other takes its bearings on the outside of the bushing of the forked rod. In the Wisconsin twelve the connecting rod bearing can be taken up readily, which is not the case with the forked rod type.

The camshafts run in special bronze bearings, and are assembled with the rocker levers complete in an aluminum housing, which bolts to the top of the cylinders. The camshafts on the six-cylinder motor are driven by a vertical shaft and level gears from the crankshaft. The magnetos are driven by spiral gears from the vertical shaft.

On the twelve-cylinder motor the camshafts are driven by a train of ball-bearing spur gears from the crankshaft. The four magnetos are mounted side by side on a long bracket and are driven off from the train of spur gears.

The valves seat directly in the cylinders and are not carried in cages. The valves are inserted through the lower end of the cylinder in assembling. The absence of the valve cage insures better cooling of the valves. Tungsten steel is employed in the valves so that they require very little regrinding and a special steel wire is used for the springs, so that a spring failure is very remote. As an extra precaution, double valve springs are employed, the inner auxiliary spring acting as a safety to prevent the valve falling into the cylinder, should the outer or main spring break.

The oiling system is of the circulating pressure type and is so designed that it will operate perfectly with the motor inclined 15° as in climbing or 30° gliding, and this oiling system as well as the materials used in the construction of the motors is more fully described in the detailed specifications following:

Six-Cylinder Aviation Motor Specifications

Cylinders. Cylinders are cast in pairs of a special aluminum alloy, and are thoroughly water jacketed, the heads being cast integral with the cylinders. The bolt lugs are very strong and well ribbed to the cylinder walls. The barrels are lined with hardened steel sleeves accurately ground to size. The valve seats are of cast iron of special construction and cast securely in position. All valve passages are of liberal size. The valve guides are of cast iron. Provision is made for two spark plugs per cylinder, these entering horizontally, one on each side. Water enters at the lower end of the jacket and leaves at the top. Drain cocks and priming cups are provided. Cylinders are carefully tested with water pressure to insure against leaks or imperfections.

Pistons. Pistons are made of same grade of aluminum alloy as the cylinders. The heads are well ribbed to give ample strength, at the same time give minimum weight. The wrist pin lugs are stiffened by webs, and are not bushed, the wrist pins operating directly against the aluminum alloy, which has been proven an excellent bearing metal. Two ring grooves are provided at the upper end, while the lower end is made with a number of oil grooves.

Wrist Pins. The wrist pins are made of nickel steel, hardened and ground, and are hollow. They are clamped in the upper end of the connecting rod, thus giving a wide bearing surface in the piston.

Crankshafts. Are made of chrome nickel steel, heat treated, and machined all over. The pins are bored with one-inch holes to reduce weight. All bearings are accurately ground to size. A large ball thrust bearing is provided to take care of thrust from propeller in either direction and another radial type of ball bearing is fitted at the end near the propeller to take the radial load. A long taper fit is provided with key and nut for securing propeller to shaft.

Camshafts. Are made of chrome nickel steel, with cams forged integral, and carefully hardened and ground.

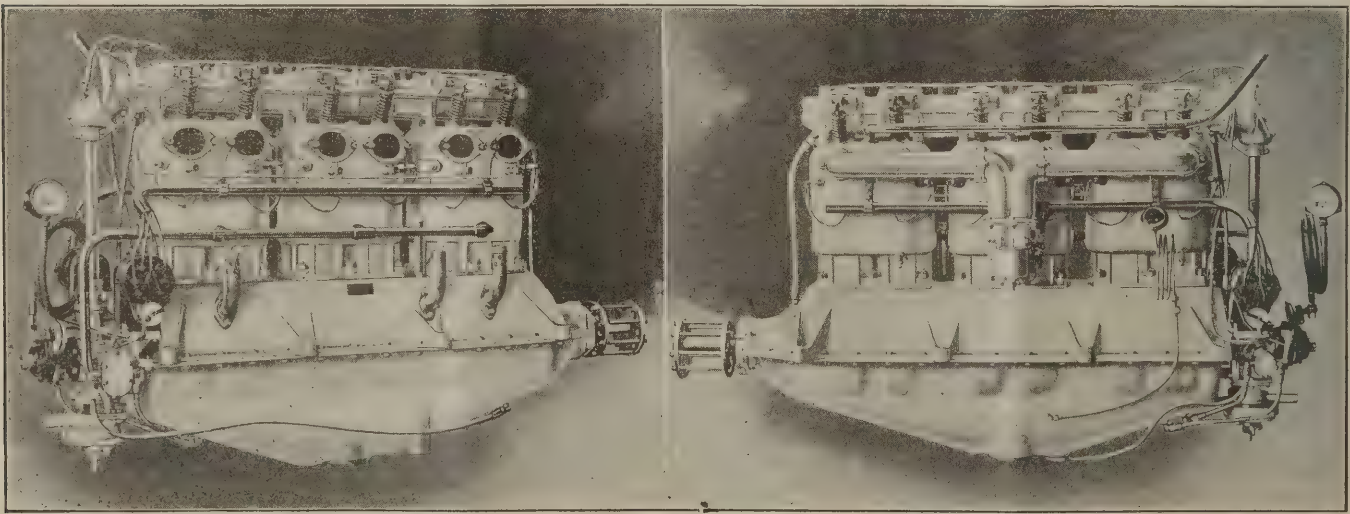
Valve Rocker Levers. Are drop forged of chrome vanadium steel and are heat treated to give greatest strength possible. They are of "I" beam section and very light in weight. The cam rollers and pins are made of special steel, hardened and ground and fitted to the inner ends of the valve rocker levers. The outer ends are provided with hardened adjusting screws and clamp bolts. These levers are bushed with bronze and rock on hardened and ground steel pins. Oil pockets are formed in the levers to insure proper lubrication.

Camshaft Housings. Are made of aluminum well ribbed and securely bolted to the cylinder heads. Oil troughs are formed in these housings to lubricate the cams, and ducts are also cast in them to return the excess oil to the crankcase. Bronze bushings are fitted for the camshaft journals.

Valves. Valves are three inches in diameter, of rich tungsten steel. Double valve springs of vanadium spring steel are provided which are held in place by split bushings and nickel steel spring seats.

Crankcases. Are of aluminum alloy, well ribbed, making them very strong. Crankshaft bearings are supported by massive webs. Bearing caps are secured by four chrome vanadium bolts each. Cylinder bosses are of sturdy construction and fitted with shouldered studs for holding cylinders in place. Breathers are provided at both ends and an oil filler in the center of the case. An oil level indicator is also fitted to the crankcase near the oil filler. The lower crankcase carries the oil reservoir and oil strainers. The upper and lower halves are securely bolted together by through bolts.

Bearings. The main and connecting rod bearings are of bronze with Fahrig metal lining. Oil grooves are provided



to insure perfect lubrication. Camshaft, and other bearings, are made of special high duty bearing bronze.

Gears. Timing gears are made of chrome nickel steel, heat treated.

Manifolds and Pipes. Inlet manifolds are made of aluminum, and are finished smooth on the inside to give a free passage to the gas. Water pipes are made of brass tubing. All pipes and manifolds are secured to cylinders by flanges and studs.

Water Circulation. The centrifugal water pump is made of aluminum and is of ample capacity to cool the motor under full load, with a proper sized radiator. Generous stuffing boxes are provided on the pump shafts. The entire water pump can be easily detached in a few moments.

The Lubrication System. Is planned to operate with motor inclined in any direction, as in climbing or gliding, and to accomplish this three oil pumps are accessibly located at gear end of the motor, two of these being somewhat larger than the third. The two larger are called the scavenging pumps, while the smaller is the pressure pump. The oil sumps at the bottom of the motor is separated from the crank chamber by an oil-tight partition. The two larger or scavenging pumps draw the oil (one from each end of the crank chamber) through strainers, and deliver it to the oil sump, and from here the smaller or pressure pump delivers it to all parts of the motor, as will be described later. The object of the scavenging pumps is to keep the crank chamber drained of oil, and the capacity of either one of these must be larger than that of the pressure pump, as when the motor is inclined one of the scavenging pumps must drain all of the oil out of the crank chamber. When the motor is running in a horizontal position, of course both scavenging pumps will be in operation.

From the oil sump the pressure pump draws the oil through a strainer and delivers it to a main duct cast integral with the crankcase. The oil tube between the pressure pump and this duct passes through the lower water circulation pipe so that the oil is cooled by the water. From the main duct the oil is distributed through passages drilled in the crankcase to the main bearings. The main bearings are provided with grooves which register with holes in the crankshaft, and the oil is forced through the hollow crankshaft to the connecting rod bearings. The connecting rods are fitted with oil tubes, which carry oil to the wrist pins and pistons. The excess oil drains back into the crank chamber and is pumped back into the sump by the scavenging pumps.

An oil lead is also provided from the main oil duct to the camshaft housing, furnishing the cams, rocker levers and camshaft bearings with lubrication. An additional strainer is provided in this oil line to prevent the small oil holes above from becoming clogged.

This strainer can be easily cleaned. Part of the excess oil in the cam housing is led back to the crankcase through the bevel gear train at the front end of the motor, thus lubricating the gears and the vertical shaft. The balance of excess oil is led back through two oil return tubes, one at each end of the cam housing.

The oil pressure in these motors should be carried at ten to twelve pounds and for this reason a relief valve is provided on the main oil duct, also a pressure gauge.

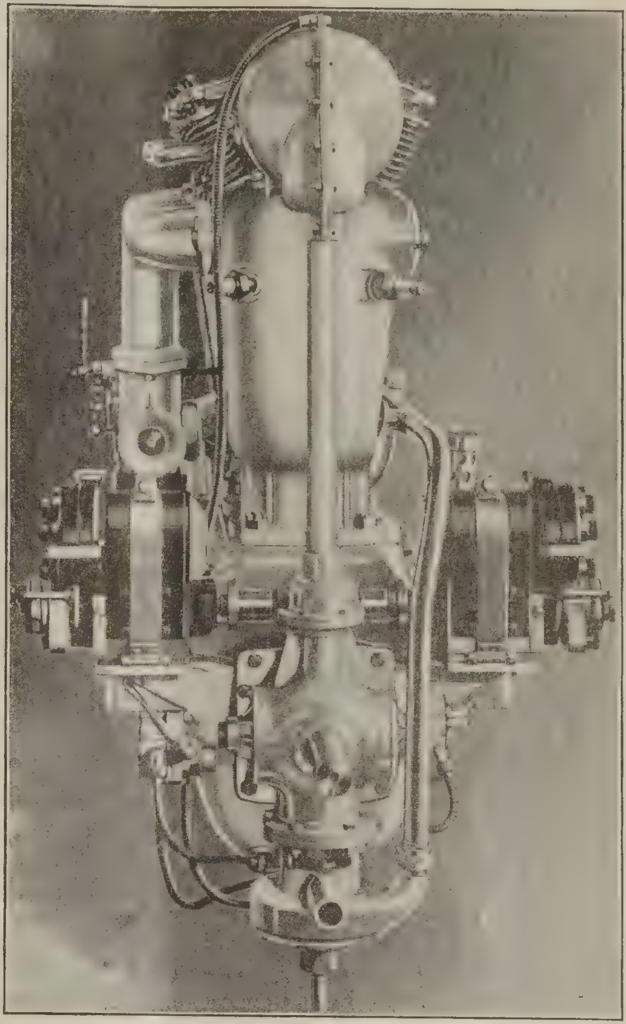
An oil level indicator is also provided, so that the amount of oil in the sump can be noted at all times.

Ignition. Two magnetos are provided, each having an entirely separate system of wiring and plugs. Both magnetos operate at the same time and both are connected to a spark advance shaft through suitable levers and links, so that both are advanced simultaneously. Should one magneto fail the other would still operate the motor with but slight loss in power. The magnetos are held in place by dowel pins and straps and can be easily removed for inspection or repairing.

Testing and Inspection. After assembling, the motors are run in on belt stands, with a copious supply of oil to work all bearings into a bright surface. The motors are then mounted on the test stands, coupled up with dynamometers, and given a test of ten hours under full load. After test the motors are taken down, every bearing, piston, valve, gear or other part subjected to wear examined as a final inspection. The motors are then reassembled, given another run on the belt stand, when they are ready for shipment.

All parts of the motors are inspected for defects in materials or workmanship after every operation, and any parts not up to the standard are rejected. The cylinders, crankcases and other aluminum parts are scraped and finished to a smooth surface. Brass or bronze parts are highly polished so the motors have a very handsome appearance and can be very easily kept clean.

The plant is equipped with the most up-to-date machinery and methods for turning out the highest class of work and all motors are fully guaranteed against defective workmanship or material.



TWELVE-CYLINDER AVIATION MOTOR SPECIFICATIONS

The specifications for the six-cylinder motor apply also to the twelve-cylinder except in the folowing instances:

The connecting rods are made of chrome vanadium steel forging, double heat treated of tubular section, machined all over to afford the greatest strength with minimum weight. One set of rods carries the crankpin bushings, and this set of rods is provided with lugs near the lower end, which carry a hinge pin, to which the other set of rods is connected. This construction gives large crankpin bearings and an engine which is practically no longer than the six-cylinder.

Water circulation. A double centrifugal pump is fitted so as to more uniformly distribute the water supply to the cylinders. One section of the pump supplies the right-hand cylinders, the other section the left hand cylinders.

The oiling system is similar to the six-cylinder except, of course, more oil leads are necessary to lubricate the two cam housings and four oil return tubes are necessary instead of two. The train of spur gears driving the camshafts and magnetos receive oil from the overflow from the camshaft housings.

Ignition is furnished by four six-cylinder magnetos, two magnetos for each set of six cylinders, furnishing two entirely independent systems. The magnetos are very conveniently located at the gear end of the engine on a bracket and can be readily inspected or removed for repairs.

The motors are water cooled with centrifugal pump circulation. On the twelve a double pump is provided, one section for each set of six cylinders, to insure uniform cooling.

Two separate and entirely independent systems of ignition are provided, each cylinder being fitted with two spark plugs. The six-cylinder motor has two Bosch single spark magnetos and the twelve has four similar magnetos. Both sets are in operation at the same time, but should one set fail, the other set would still operate the motors at only a slight decrease in power.

The normal speed of the motors is from 1,200 to 1,400 r.p.m.

The six-cylinder will develop 130 h.p. at 1,200 and 145 h.p. at 1,400 r.p.m.

The twelve-cylinder will develop 250 h.p. at 1,200 and 280 h.p. at 1,400 r.p.m.

The fuel consumption is from .6 to .7 pint of gasoline per horsepower per hour and the lubricating oil consumption .03 pint or less per horsepower per hour.

The capacity of the oil chamber is four gallons on the six and six gallons on the twelve.

The weight of the six-cylinder is 600 pounds, with carburetors and magnetos. The weight of the twelve is 1,000 pounds.

THE DEVELOPMENT OF ENGINES SUITABLE FOR AERONAUTIC SERVICE

Origin—Means Used, and Results

By CHARLES E. LUCKE

(*Continued from page* 271)

Attention is called to these rules in the appendix and especially to the alterations in later German rules as compared with the earlier, all directed toward greater latitude and greater reliance on the judgment of competent engineers and proportionately less on the numerical values of those quantities that are subject to measurement and which require experienced, cultivated judgment to interpret into terms of engine goodness, which often depends as much on intangible things, such as workmanship, ruggedness, simplicity and the other factors of general adaptability. In this connection there is a most significant, though guarded, statement at the end of the second report of the Deutsche Versuchsanstalt für Luftfahrt by Dr. F. Bendeman, January, 1913, the best document on the subject in existence herewith quoted:

> The further development of the aeroplane and engine construction makes it seem desirable that in a future competition the engine be judged more in its relation to the *operating conditions* of the machine.

Even at best, better than yet arranged, the contest exerts but an indirect effect on engine development, it results in a public statement of a judgment of the machines relatively considered with reference to the rules and to each other. The winner is stated to be that engine that has best fulfilled the prescribed conditions; it is announced as better than others in this respect, and that is all. Any test that measures only over-all results, whether of fuel and oil consumption, weight, horsepower, speed, unbalanced forces, torque variation, or similarly measurable quantities is faulty as a factor in direct development of engines to perfection. The only sort of direct contribution that can lead to true scientifically sound advance is that generally termed research, which involves the patient analysis of not only over-all performance but more particularly of the performance of each part intended for the execution of every separate function, the accumulation and interpretation of data for the diagnosis not of the faults found but the determination of their causes and discovery of remedies, all of which are to be followed by the application of the promising prospective cures with test checks on their success. This sort of work requires the highest class of training and skill and is to be carried out as much in the computing and drafting room as in the laboratory, but to do most good to a young art struggling blindfolded to advance, every result must be not only convincingly and accurately arrived at but must be given wide publicity. This is the kind of development work that must be done and has not yet been attempted anywhere outside of a few establishments producing engines, and in them is only carried on to a small degre because of the heavy expense, and naturally this same expense is sufficient reason for nonpublicity.

Research and publicity of the data of research are far more needed than public contests and their reports. While the latter are in a way an expression of the conclusions of the former, they give no clue to the means found necessary to bring them about, no more than the sight of a man cured of an illness by a physician gives the observer any idea of the physician's diagnosis and methods of cure. The advance of the profession or art is more important than an isolated case of perfection.

However sadly lacking are the data of research on aero engines, what literature there is descriptive of engines, of conditions of flight, of experiences, successes, and failures, of contests and over-all performances should be most thoroughly collected and recirculated in the form of collected papers.[1]

Part 1 (*c*).—GENERAL CHARACTERISTICS OF PRESENT AERO ENGINES: POWER, Speed—Engine, Radiator, Water, Gasoline and Oil Tank, Weights—Fuel and Oil Consumption, Aggregate Power-Plant Weights With Full Tanks for Given Length of Run—Engine Types.

Since the period 1901-1903, with the two engines, Wright of 12 horsepower, a converted four-cylinder, vertical automobile engine weighing for engine alone about seven pounds per horsepower and the then novel Manly design of radial star fixed cylinder engine of 50 horsepower, weighing for engine alone 2.4 pounds per horsepower, there has been produced in the interval more than a hundred different designs that have survived the stage of first trial. There are now on the market perhaps half this number of different engines being regularly reproduced, each to some extent and several quite extensively (for this art), and of several of these designs engines are available in more than one size.

While most of these engines have capacities of 50 horsepower, more or less, the number that reach or exceed 100 horsepower is steadily increasing, following the demand of the aeroplane and made possible by greater experience in construction of the smaller sizes. It is worthy of note that the 1913 winner of the Gordon-Bennett cup race carried 200 horsepower, and the Russian Sikorsky used in his 17-passenger machine 400 horsepower in two engines. The latest Curtiss aeroplanes carry 320 horsepower in two engines, and the English Sunbeam catalogues a single engine of 225 horsepower. While some types of engine construction give trouble in large sizes, there is no reason to believe that the limit of engine capacity has been anywhere nearly reached, for even if a high limit of cylinder diameter can be found, which is not the case yet, multiplicity of cylinders can carry up total capacity. Naturally there is no limit to the number of separate smaller capacity engines that may be placed in one air craft except that as the weight per total horsepower of two or more engines is always greater than of one engine of equal aggregate capacity. On the question of total power there is no high limit in sight, though the normal is somewhat about 100 horsepower. Germany in 1914 required for her latest army planes 80 to 120 horsepower, and more for hydroaeroplanes, while the United States Navy specifications of 1915 call for 100 to 160 horsepower. It may easily happen that this trend toward larger engine capacities will result in the elimination of some styles of engines which only operate well in smaller units, or what is more likely as the number of different types of air craft increases in the limitation of engine type to flying machine type.

Speeds of engines are all in excess of 1,000 revolutions per minute, most engines operating normally between 1,200 and 1,500 revolutions per minute, with a few exceeding 2,000 revolutions per minute, the highest being the Sunbeam engine, rated at 2,500 revolutions per minute. These, of course, are the speeds when carrying normal full load, and therefore a reduction of load, such as would follow a change of propeller to one of lesser torque or such as results from a gust of air in the direction of propeller air discharge, will accelerate the speed. This is because the full throttle, mean torque, of these engines is about constant up to speeds considerably in excess of their normal, probably approaching 2,000 revolutions per minute for most of them, though in all mean torque will decrease beyond some critical speed, due to valve and port resistance on the one hand and insufficient speed of combustion on the other. Below this critical speed, which is partly a matter of design of valves and ports, the horsepower is directly proportional to speed, and so speed increase is a natural means of reaching the light weight per horsepower of engine. It does not necessarily follow, however, that, because in a given engine the high speed does not reduce the mean driving torque, the engine will not suffer from the speed. In fact, it is just here that so many of the failures are found, the engines literally shaking themselves apart and pounding or grinding themselves to pieces. With due attention to the forces developed by high speed, and to bearing friction effects of rapid motion over loaded sliding surfaces, and to the suitable arrangement as well as proportions and materials for it, there is no reason why, from the engine operation standpoint, the present normal range of 1,200 to 1,500 revolutions per minute should not be exceeded if the service demands it, though the engine designer's problems are easier, the lower the speed. It must be noted that there seems to be no essential relation between propeller speed and engine speed if the operator has no objection to gearing, which in these days of automobile alloy steel gears can be made probably the most reliable element of the machine. Testing of engines at excess speeds to limits of unbalanced forces, bearing friction wear, and mean torque would seem to be a

[1] A more or less complete bibliography of aero engines is offered in Appendix 3 as a nucleus, as full as the limited time available will permit, and to show the character of some of these papers, a selected few are reproduced. To complete this bibliography and republish these papers will be of very great service to the art, especially if there be added a corresponding colection of patents in all countries either in full or in abstract.

rational means of assuring that the operating speed itself will not cause trouble, however much other causes might enter. Such a practice would be somewhat in accord with the hydrostatic test of 50 per cent excess of working pressure now standard with steam boilers and somewhat similar because each may in emergency reach that excess, in the one case of speed and in the other of pressure which may cause failure.

Engine weights now attained, per horsepower developed, exclusive of tanks, radiators and supplies of gasoline, oil or water, by the several classes or types of machines, at their own normal speeds, have not been materially lowered for some time, attention having been rather concentrated on the reliability and adaptability factors with existing weights, instead of on further weight reduction, though this will undoubtedly come in time. There is, however, a rather marked division of unit engine weights according to system of cooling of engine, whether by air or by water, involving besides water weight, that of radiator. For example, the most popular French rotating star cylinder air-cooled Gnome engine weighs just about 3 pounds per horsepower, ranging from 2¼ for 100 horsepower to 3 1/3 for 50 horsepower, while the vertical water-cooled automobile style and winner of the last German competition weighs 4.2 pounds per horsepower. (A number of tables and some charts of engine weights are given in the papers in the appendix which are not repeated here, as it would serve no good purpose.) Attention is, however, called to the fact that the highest weight reported in the German competition (second) is about 6 pounds. This is about the present high limit, while 2.2, the value for the Gnome 100 horsepower, is the low limit, the water-cooled group occupying the upper portion of this range, the air-cooled its lower portion. It is most interesting to note that the middle range in the neighborhood of 4 pounds is occupied by both types, providing that water-cooled engines can be built as light as some kinds of air-cooled engines, or that air cooling does not necessarily result in the lightest engine.

Whatever influence in this unit weight of engine alone the general arrangement may have is shown by a comparison of figures for some typical differences of arrangement or type. It ordinarily is of the order of a fraction of a pound and may be entirely offset by some other structural feature, not a factor in general arrangement, such as the use of a steel cylinder in one arrangement against a cast-iron cylinder in the other, or a high mean effective pressure in one against a low value in the other, due to different weights or active mixture taken in per stroke. It would seem that cylinders set radially about a short single throw crank should yield an engine weight per horsepower less than the same number of cylinders set in line along a long multi-crankshaft. Also that a V arrangement of two lines of cylinders should weigh less than a single line because of shaft and frame differences, but it is not clear whether a given output in four cylinders will yield a greater or less weight than in six or eight similarly arranged, nor is it clear just what difference in horsepower, if any, should be expected per unit of displacement per minute in water-cooled as compared with air-cooled cylinders. As pointed out, according to the general figures given, the aggregate of all such differences lies between the limiting weights of about 2½ pounds and 6 pounds per horsepower, and therefore covers a range of about 3½ pounds per horsepower for such engines as are now in use and for which test data are available. Just how much of this difference is chargeable to one or another of the factors of arrangement, detail form, proportions, or material, it is not possible at the present time to accurately fix, but as a first attempt the following figures (Table I) are given as derived from available data:

TABLE I.—*Weights of engines in pounds per horsepower versus type construction.*

Cylinders and cooling.	Class construction.	Engine name.	Authority.	Weight. Alone.	Weight. Plant.
				Lbs.	*Lbs.*
Water-cooled fixed cylinder	4 cylinders in line.	Benz	Bendemann	3.57	4.20
	6 cylinders in line.	Daimler	do	3.75	4.36
	8 cylinders in line.	Sturtevant	Maker	3.9	....
	12 cylinders U	Sunbeam	do	4.0	....
	Radial star	2-cycle laviator	"Flight"	3.02	....
Air cooled: Fixed cylinder	8 cylinders U	De Dion Bouton	do	....	5.81
	12 cylinders U	Renault	do	....	6.38
	Radial star	British Anzani	Maker	....	4.0 3.4 4.1
	Special	Ashmussen	do	3.3	....
Rotating cylinder	1 radial star	B. M. and F. W.	Bendemann	4.72	4.72
	2 radial star	German Gnome	Maker	....	3.086 2.480 2.701

TABLE I.—*Weights of engines in pounds per horsepower versus type construction*—Contd.

Cylinders and cooling.	Class construction.	Engine name.	Authority.	Weight. Alone.	Weight. Plant.
				Lbs.	*Lbs.*
Water-cooled fixed cylinder	4 cylinders in line.	Daimler	Bendemann	4.29	4.92
	6 cylinders in line.	do	do	4.60	5.23
	8 cylinders in line.	Curtiss	Maker	4.0 3.4 4.4	....
	12 cylinders U	Rausenberger	do	3.9	....
	Radial star	Salmson	Soreau	....	5.47
Air cooled: Fixed cylinder	8 cylinders U	Renault	"Flight"	....	5.66
	Radial star	British Anzani	Maker	....	3.6 3.7 3.4
Rotating cylinder	1 radial star	Gyro	Bendemann	4.81	4.81
	2 radial star	Le Rhone	Maker	....	2.9
Water-cooled fixed cylinder	4 cylinders in line.	Daimler	Bendemann	4.74	5.37
	6 cylinders in line.	Argus	do	4.60	5.23
	8 cylinders in line.	Sunbeam	Maker	4.1	....
	Radial star	Salmson	"Flight"	4.15 3.42 3.3	....
Air cooled: Fixed cylinder	8 cylinders U	Wolseley	"Eng'y"	....	[1]4.7
	Radial star	Edelweiss	"Flight"	....	3.68 2.82
Rotating cylinder	1 radial star	Gnome	Bendermann Lumet.	3.26	3.26
Water-cooled fixed cylinder	4 cylinders in line.	Daimler	Bendemann	4.89	5.52
	6 cylinders in line.	Mulag	do	5.14	5.77
	8 cylinders in line.	Clerget	"Flight"	3.2	....
Air cooled: Fixed cylinder	Radial star	2-Cycle Laviater	do	....	3.05
Rotating cylinder	1 radial star	Gnome	Bendemann Lumet.	2.93	2.93
Water-cooled fixed cylinder	4 cylinders in line.	Daimler	Bendemann	5.09	5.72
	6 cylinders in line.	Schröter	do	4.65	5.28
	8 cylinders in line.	Laviator	"Flight"	3.43 3.48	....
Air-cooled: Rotating cylinder	1 radial star	German Gnome	Maker	....	3.439 3.197 2.590
Water-cooled fixed cylinder	4 cylinders in line.	N. A. G.	Bendemann	4.33	4.96
	6 cylinders in line.	Hall Scott	Maker	4.32	5.15
	8 cylinders in line.	Panhard Levassor.	"Flight"	4.4	....
Air-cooled rotating cylinder.	1 radial star	German gnome	Maker	....	2.976
Water-cooled fixed cylinder	4 cylinders in line.	N. A. G.	Bendemann	4.36	4.99
	6 cylinders in line.	Austro-Daimler	Maker	....	4.5
	8 cylinders in line.	Wolseley	"Eng'y"	5.38	....
Air-cooled rotating cylinder.	1 radial star	Le Rhone	Maker	....	3.1
Water-cooled fixed cylinder	4 cylinders in line.	Argus	Bendemann	3.77	4.40
	6 cylinders in line.	Benz	Maker	4.1	....
	8 cylinders in line.	E. N. V.	Alexander Prize Report.	....	6.1
Air-cooled rotating cylinder.	1 radial star	Gyro	Maker	....	3.25–2.88
Water-cooled fixed cylinder	4 cylinders in line.	Argus	Bendemann	4.38	5.01
	6 cylinders in line.	Wright	Maker	5.1	....
Air-cooled rotating cylinder.	1 radial star	Clerget	"Flight"	....	3.3–2.7

[1] Without flywheel.

TABLE I.—*Weight of engines in pounds per horsepower versus type construction*—Contd.

Cylinders and cooling.	Class construction.	Engine name.	Authority.	Weight. Alone.	Weight. Plant.
				Lbs.	*Lbs.*
Water-cooled fixed cylinder	4 cylinders in line.	Sturtevant	Maker	4.0	....
	6 cylinders in line.	Green	MacCoult	4.4	....
Water-cooled fixed cylinder	4 cylinders in line.	Cheno	"Flight"	3.91 2.87 3.97 2.8	....
Water-cooled fixed cylinder	4 cylinders in line.	Clerget	"Flight"	4.28 3.96	....
Water-cooled fixed cylinder	4 cylinders in line.	Green	Alexander Prize Report.	5.48	6.8

These figures show a consistent weight excess for cylinders in line over radial, but no conclusions can be drawn on the relations between water vs. air cooling for either fixed or rotating cylinders. More data and data in greater detail than are now available are necessary before such conclusions are possible. In later tables the figures are analyzed with reference to other units and some desirable conclusions are derived, but always there must be noted the data which one would expect at this date to be quite full and reliable are found to be both meager and uncertain.

(To be Continued)

FOREIGN NEWS

BRAZIL

The Brazilian Minister of Marine has commissioned Lieutenants Raoul Vianna Bandeira, Vicente Oruro Preto, Virginio Delamara and Victor Carvalso Silva to make trials of hydroplanes purchased in the United States for the Brazilian navy.

CHILE

The Government of Chile has established an aviation school near Santiago, where army and navy officers are being trained.

FRANCE

On the nights of May 10th and 11th, four French aeroplanes dropped twenty-six bombs on the railroad stations of Damvilliers and Etain, and upon a park near Foameix where a fire broke out.

The long-vaunted superiority of the Fokker aeroplane is doomed to wane according to the Paris *Journal*. The Fokker has been a thorn in the sides of the aviators of the Allies for a long time because of its superior speed and climbing ability.

According to the *Journal* a new aeroplane, fitted with a motor of new design, has twice beaten all world records for speed and the record for military machine in peace time. The latest French fast flying scout machines, it adds, will easily get the better of the Germans and leave their machines far behind.

C. G. Grey, editor of the *Aeroplane*, in an interview threw some light on the achievements both of the French and the British in combating the latest German attempt to secure ascendency in the air.

"The Fokker," he said, "is only a very bad copy of a French machine, the Morane, with a very big engine. But we have had in this country for about eight months privately built machines which outclass the Fokker in every way, not only in speed, but in climbing and weight lifting power. It was not until attention was drawn to the existence of the Fokker, however, that the Government officials began buying them."

It is reported from Toulon that a French dirigible balloon which passed there recently from Paris fell into the sea off the Sardinian Coast. Six persons aboard all appear to have perished. The Italian authorities sent out rescuing parties which recovered four bodies. These were brought to Toulon by a French warship.

The official report for May 14th is as follows:

"On the night of May 12-13 one of our squadrons composed of ten aeroplanes threw forty-three shells on the railway stations at Nantillois and Brieulles and on camps in the regions of Montfaucon and Romagne.

"On the same night one of our aeroplanes threw eleven shells on the hangar for dirigibles at Metz-Frescaty (a suburb of Metz)."

"Near Vauquois an enemy aeroplane, compelled to land inside his lines after a combat, was destroyed by our cannon," says a French official of April 26. "In the region of Verdun one of our pursuit aeroplanes brought down a German aeroplane, which fell on Cote du Poivre, about fifty meters from our trenches.

"A third enemy machine brought down by one of our pilots fell in the Forges wood. Finally a Fokker, fired at point blank by one of our aviators, plunged down in the region of Hatton-chatel.

"Last night one of our dirigibles dropped ten shells of 155 millimeters and six shells of 220 on the Conflans station."

A French aeroplane and a Zeppelin fought at an altitude of 4,000 meters off Zeebrugge on April 26. The aeroplane fired nine incendiary shells at the Zeppelin, which appears to have been damaged. The engagement, occurring more than two miles from the surface of the earth, was fought at 3 o'clock in the morning.

At the same time another French aeroplane, armed with cannon, fired numerous projectiles on a German torpedo boat off Ostend.

GERMANY

The official German report for April 26 is as follows:

Apart from other aerial enterprises, one of four flying squadrons dropped a large number of bombs on the French flying ground at Brocourt, east of Clermont, and heavily shelled the village of Judecourt.

Two enemy aeroplanes were shot down in an aerial fight above Fleury.

The following is from the official report of April 24:

"Last night our aerial squadrons carried out several bombarding operations. Twenty-one shells and eight incendiary bombs were dropped on the railway station at Longuyon, five shells on the station at Stenay, twelve shells on bivouacs in the region at Montfaucon and the station at Nantillois."

Reports have been received to the effect that a short time ago a fire started in an aeroplane factory at Altona, Prussia, an explosion occurring while a mechanic was pouring gasoline into a machine. Sixty-two new machines were destroyed which were to be sent out for service, and the factory was completely burned.

Two of the French balloons which broke from their moorings in the French lines in France, May 6, landed near Hanover, May 10. One of the balloons was manned by a crew of three soldiers, apparently officers, who have not yet been captured.

The destruction of another Zeppelin is reported in a despatch from Copenhagen. It is said that the Zeppelin was brought down off the coast of Norway and that three British destroyers went in pursuit of it.

GREAT BRITAIN

The aviator reported missing after the Zeppelin raid of April 25 was brought to shore on April 27 by a Dutch lugger. The aeroplane was picked up with its occupants fourteen miles off the coast after it had floated helplessly there for thirty hours. The aviator had been obliged to descend because of lack of fuel.

"One of our fighting machines attacked an enemy aeroplane and drove it down. The hostile machine was last seen close to the ground and out of control.

That England is building airships of the Zeppelin type was disclosed in the House of Commons on May 8 by Thomas James Macnamara, Financial Secretary to the Admiralty, in reply to a question of a member. Mr. Macnamara stated that it was not to the public interest at the present time to say how many of these airships Great Britain has completed.

In a recent communication, Flight Sergeant T. May, of the Royal Flying Corps, describes a battle 15,000 feet in the air against odds of three to one. His story follows:

"We were on patrol duty over the enemy's lines when we were attacked by a number of German machines, including some of the noted Fokker monoplanes. We saw them preparing for the attack, and as we were quite ready we waited for them.

"We rose to a height of between 14,000 and 15,000 feet before the fire began. They, as usual, attacked from the rear, being faster machines. I was with my officer, and he said, 'Mind and give them some lead.' I waited until they came ridiculously near and then emptied a full magazine into them. The machine fell like a log out of my sight, and I am sure they paid the price.

"This finished rear attacks. The next one came more to the front, so I let him have some at greater range. They must have been hit, for the machine made a nose dive and cleared off at once. I could not see the result, for we were attacked immediately by another one before I knew where I was. I could see him flying at us before I was ready, and by the time I had fired five or six rounds I was hit by a bullet that went through my thigh.

"Almost at the same moment an anti-aircraft shell hit us, blowing my seat away, large pieces of shell piercing my thick leather flying jacket. I was stunned for some time, but I was in no position to do a faint, so I pulled myself together. We made for our lines, some fifty miles away, doing 'ducks and drakes' to avoid anti-aircraft shells. We reached our lines safely, but there was no hospital, so we set off again by aeroplane to the nearest, where I was quickly attended to."

A despatch from Cairo says that two hostile aeroplanes dropped eight bombs on Port Said on May 8. Three civilians were wounded and the aeroplanes were driven off by anti-airship guns. There was no property damage.

To thwart the Zeppelins in their night raids over England, the British are trying to develop decoys. Since factories and barracks are the objective points of attack, the first experiment was made by cutting "window holes" in a row of immense billboards along a railway and illuminating the orifices with a carbide lamp. Other decoys consist of sections of artificial walls pierced with windows, made to represent the skylighted roofs of factories and barracks. The sections are easily hooked together and are made in such a manner as to be carried on big war motor trucks.

GREECE

An aerial attack on Majadagh, near the Greek-Serbian frontier, southwest of Doiran, in which fourteen civilians were killed, was recently reported in a despatch. The raid occurred on the 12th. A number of people were wounded. The German report of the raid is as follows:

"Hostile aeroplanes which dropped bombs on Mirovtza and Doiran were driven off by the fire of our anti-aircraft guns."

ITALY

On May 7 a strong squadron of Italian aeroplanes flew over the Adige Valley, and dropped numerous bombs on Mattarello and Calliano, where enemy troops were concentrated. All the aviators returned safely, though they were fired upon by anti-aircraft guns. An enemy squadron flew over the plain of the lower Izonzo, dropping bombs but caused neither material damage nor casualties.

Colonel Pastine, a widely known Italian aeronaut, who was a competitor in the international balloon race from Paris in 1913, was killed recently near Gorizia when his airship was shot down.

Colonel Pastine was chief of the Italian airship brigade.

Colonel Pastine was third in the international balloon race which started from Paris on October 12, 1913. There were eighteen competitors, and the race was won by Mr. Ralph Upson, who landed four miles north of Bridlington, in England, on the Yorkshire coast. Colonel Pastine landed in the Roma, at Plouezoch, Finistere, France, after a trip of 267 miles.

On May 10th enemy aviators threw bombs near the Ospedi Eppo station in the Sugana valley, killing some horses. Italian aeroplanes bombarded the station of St. Pietro de Gorizia and the environs of Asievissa.

NORWAY

According to a despatch from Christiania six men of the wrecked Zeppelin L-20 have been released in view of the lack of international regulations regarding airships.

The Norwegian government decided to follow the law governing shipwrecked crews of belligerent warships. In accordance with this decision six men from the Zeppelin who had been rescued by private boats were liberated.

The Zeppelin L-20 was blown ashore on the west coast of Norway on May 3 and wrecked against the side of a mountain. Despatches the day following stated that all the sixteen men composing the crew were rescued and interned by the Norwegian authorities. The airship when wrecked was supposed to have been returning from an attack on the east coast of England and Scotland.

TURKEY

An official Turkish communication, dated May 10, says that two Turkish aeroplanes dropped bombs successfully on April 25 on the drydock and oil tanks at Port Said. A Cairo despatch said eight bombs were dropped on Port Said on May 8, causing no property damage but wounding three civilians.

The official Turkish report for May 8 is as follows: "On May 6 two enemy aeroplanes threw ten bombs on a ship cruising near Akke-Bahr, slightly injuring one soldier. Off the Island of Imbros a monitor and a cruiser, supported by the observation of aeroplanes, threw forty shells on the environs of Sedd-ul-Bahr without effect. One of our aeroplanes hit an enemy cruiser with two bombs. The cruiser, wrapped in smoke, took to the open sea."

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Aero Science Club

On Saturday evening, May 6, 1916, the club had several visitors from its out-of-town affiliated clubs, among them Mr. R. A. Smiley, of the Illinois Model Aero Club, and Mr. Charles H. Munsall, President of the Springfield (Mass.) Model Aero Club. Pleasant discussions on various incidents and happenings at model contests ensued. Among those present at the above meeting was Mr. Nicholas Schloeder, the well-known model writer, and general information bureau on model flying.

On Saturday evening the club had the pleasure of having Mr. Mathew B. Sellers speak. Mr. Sellers spoke on the experiments carried on by him with his aeroplane which was driven by a ten horsepower engine weighing approximately thirty pounds, the complete machine weighing 110 pounds. Owing to a recent accident Mr. Sellers has been compelled to abandon his experiments temporarily, but will resume them as soon as he has completely recovered.

The contestants for the next competition for the Willard Trophy were selected and the names and date of the contest will be published later.

The Illinois Model Aero Club

On Sunday, May 7, the club held the duration preliminaries in the National Model Competition. Conditions were very bad and very little flying resulted. The meet was held at Cicero with the purpose in view of witnessing Mr. S. L. Laird's first flight in his new tractor looper. The latter event proved far more attractive than the model meet, as Mr. Laird lost no time in "grass-cutting," but lifted his machine off on the first trial and ascended to an altitude of over three thousand feet in a very short time. Mr. Laird made a beautiful glide down to the starting point in his new machine.

At the last meeting of the club we had the honor of receiving back into our midst Mr. Joseph Lucas, the Benoist boat mechanic, who has but lately returned from a trip to Grand Rapids, where he has been aiding in the rebuilding of a flying boat.

The Monmouth Aero Club has lately organized and affiliated with the I. M. A. C. The I. M. A. C. intends to make itself a central Illinois Club about which the other clubs of the State can centralize their activities. It would be an excellent thing if the principal clubs of every State endeavored to co-operate in this way with the smaller clubs.

Buffalo Aero Science Club

The American Aviation Exhibition Corporation will conduct one of the largest meets ever held in America, in Buffalo, from July 10 to 22, 1916. Machines from all nations will compete for the large prizes offered, and the 22½-acre field being prepared for the event will contain a midway where aeronautical accessories, motors and all things pertaining to aviation, will be open to the inspection of the public.

The Buffalo Aero Science Club has engaged one for the purpose of exhibiting models and parts. It will also manage the model activities at the meet, and over $250 in cash prizes, a trophy and several gold medals have been offered to flyers of models.

All clubs or organizations devoted to models or individual persons wishing to compete will be given the heartiest co-operation by the Buffalo club.

The events are as follows:

R. O. G.—Distance—First prize $25; second prize $15.
R. O. G.—Duration—First prize $25; second prize $15.
H. L.—Distance—First prize $25; second prize $15.
H. L. —Duration—First prize $25; second prize $15.

Scale reproduced models, general design and workmanship—Gold medal.

A gold medal goes to the individual having the highest standing in all four events for racing models.

The trophy goes to the club or organization having the highest standing in all events for racing models.

A prize of $5 will be given to the individual whose model remains in the air for sixty seconds or over (only one sixty-second flight to count), provided that person has not won another prize.

Parties interested please communicate with the club, at 48 Dodge Street, Buffalo, N. Y.

It is interesting to note that although world records are being established with models of much greater length than the ordinary type model their performances are well known to those who have followed the sport since its inception in America. Daniel Criscouli on the right and Henry Criscouli on the left, the two flyers shown in the accompanying photograph are both members of the Long Island Model Aero Club have long since advocates of the "long" model. Dan Criscouli is here shown holding a model of four feet in length. On several occasions Henry Criscouli has flown models of over five feet in length; one of which created considerable interest, in as much as it was possible to disassemble the frame of the model and pack it in a very convenient package.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Overheard While Repairing the Machine

Weary Willie—Talkin' about will power, now. Oncet I went past eighteen saloons an' I had a dollar 'n' a half in me pocket.

Lazy Lew—You dreamed that.

W. W.—Naw, I didn't. I was in a patrol wagon.

An aviation promoter happened to be present at a football game where a certain football referee, who is a great stickler for etiquette among the boosters of the ball, was the referee.

In this match the visiting team took offense at one of their opponents, and presently their dislike took the form of audible remarks disparaging to him, his appearance and his methods of playing.

In a moment the referee turned angrily on the talkers, and said sternly:

"Cut out them personalities! Cut out them personalities, I tell you!"

Like an echo came a high-priced voice from the grandstand:

"Cut out them grammer."

Father: You've been out quite a bit playing cards lately, haven't you, my boy?

Son: Yes, father, about a hundred dollars.

"Don't touch me, officer I wear Prunella corsets and cannot be pinched."

(Courtesy Chicago Tribune)

Hobb: Baby swallowed a spoon and now——

Nobb: Yes, yes, and now?

Hobb: Baby can't stir.

Friend: You seem worried, Al. What's on your chest?

Convalescent Aviator (hoarsely—but not from emotion): Can you smell that damned liniment way over there?

"I am in favor of a larger standing army," said the hangar constructor.

"What's the idea?"

"We should have enough for a respectable corpse."

Exhibition Flyer No. 1 (at Atlantic City)—Truly this reminds me of the prodigal son.

Exhibition Flyer No. 2—How so?

Exhibition Flyer No. 1—There are so many fatted calves amongst us—*Punch Bowl.*

"How do I tell my twins apart? Sure, I sticks me finger in Dinnis' mouth, an' if he bites I know it's Moike."

To the Editor of that Dear AERIAL AGE (which I hope it enjoy maximum circulation):

With spirit of brave Japanese ancestor burning in my chest I make firm resolve not to be conquer by pieces of wood and cloth call aeroplane. I obtain employment as dish washer in childish quick lunch restaurant and in time passed make sufficience wages to pay fare to California where Japanese are so welcome (like snake.) At once I take garbage-wagon in direction of aviating ground.

Upon arrive I approach Hon. Aviator who are softly swearing at engine. "Job for intelligence Japanese?" I snuggest.

"Are you life insured for axident?" he ask it.

"I am too brave for such coward way," I deplore. "I am not possible to be killed. In Garden City I am in hospital for quite time but am tough of constitution like boarding house chicken."

"Last Japanese killed two of clock this A. M." he correspond, "you are employ."

With many thrill of joy I work in house where Hon. aeroplane are resting in many pieces. Besides aeroplane I sleep like faithful dog. In couple of weeks Hon. aeroplane pirate say, "Today you go up with me to hold bomb of many explosions." Expressions of joy from me!

We rise off ground quick like small automobile over bump. Like speed of lightnings stroke we are many miles from earth. "Light bomb at once"! (this from him). I do so. Do not throw article until I say 'throw' (also from him). Very soon he say "Now"!

"I am intelligence" I deplore, "you do not say 'Throw.'" My sensible Japanese nature are much shock by his following words. "I leave job at once," I return.

Suddenly much roar of cannons and brilliant lightings before eyes. Aeroplane sink sudden like man of much weight diving in water. When come to I am without conscious one week.

"Never more" I say like Poe's raving. Being senseless I am sensible

Hoping you are the same,

Hashimura Togo.

[More apologies to Wallace Irwin.]

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From Newport News to New York by Air Line

THE record-breaking twin-motored aeroplane which flew from Newport News to New York City in four hours and one minute yesterday has been bought by the Aero Club of America, and is to be sent to the New Mexico National Guard, which is now on duty at the Mexican border.

The aeroplane is to be equipped with a Davis two-pounder aeroplane gun, presented by the General Ordnance Company, of New London, Conn., through Mr. A. Jackson Stone, of London, a member of the firm. It is also equipped with one of the Creagh-Osborne air compasses, presented by the Sperry Gyroscope Company, of Brooklyn.

The cost of this aeroplane, which is equipped with two motors of 90 h.p., and is capable of a speed of 100 miles an hour, and of carrying 800 pounds of useful load, is $10,000. The Aero Club of America has undertaken to raise $7,500 towards paying for it, and the New Mexico National Guard, through Col. Bronson Murray Cutting, who is now in New York, has raised $2,500. The Curtiss Aeroplane Company, of Buffalo, to enable the New Mexico National Guard to have an aeroplane promptly, had turned over the machine, and will wait for payment until the club has raised the $7,500 by public subscriptions. The aeroplane will, therefore, be shipped to the Mexican border in a few days. In the meantime the club will make an appeal for contributions. Checks should be made payable to the National Aeroplane Fund, and sent to 297 Madison Avenue, New York City.

An expert aviator will be sent to the Mexican border with the machine. Both Victor Carlstrom, who piloted the machine in the Newport News to New York flight, and Stevenson McGordon, who piloted another machine in the Newport News to New York flight, would like to fly the machine to the Mexican border, which would get it there in a fraction of the time required by shipping it. Unfortunately, it would take some time to make arrangements for landing stations, where the aviators could land to get gasoline and fuel in their flight to the Mexican border. Therefore it is best to ship it.

Valuable North Island Aerodrome Should be Acquired for Army School

NORTH ISLAND, at San Diego, California, the haven of aviators, considered as the best site for an Army aviation school may be lost to aviation unless steps are taken to bring to the authorities' attention the fact that North Island is invaluable from an aeronautic standpoint.

Colonel William A. Glassford, commandant of the Signal Corps aviation school, recently expressed his approval of North Island as follows:

"North Island is most desirable for a permanent Army and Navy training base, even if it costs millions to purchase. The fact that the government may have to pay a large sum for a site for aeronautical purposes only enhances the importance of this branch of the Army and Navy. The greater the value of the site the greater will be the installation, likewise the greater will become public interest and the upbuilding of this branch of the military service will thereby receive its deserved recognition.

"For instance, if the War Department purchases a ten-cent site, then we most likely will continue to have a ten-cent flying corps. The record of the past shows this plainly.

"North Island is a nature-made place for aviation purposes. The government recognizes this. North Island would permit the construction of huge circular hangars, like locomotive round-houses, so that machines landing from any direction in which the wind may be favorable will be housed from whatever point they approach.

"North Island could be made one of the greatest military aerial centers in the world. There is room for the Army, the Navy, the marine corps, military and maneuver encampments, target ranges, and every need for space desired for military purposes."

The Union received word from Washington that Colonel Glassford will not be relieved as commandant of the signal corps aviation school. Instead, he will remain at North Island while Lieut. Col. George O. Squier will replace Lieut. Col. Samuel Reber. Colonel Squier will remain in Washington, making his suggestions derived from his observations in the European war for the betterment of the aviation corps direct to the chief signal officer of the Army. In this manner the duties of Colonels Glassford and Squier will not interfere, but both men will co-operate with the War Department.

"I am delighted to remain at San Diego," said Colonel Glassford when shown the dispatch that he would be retained as commandant of the North Island school.

18,800 POUNDS OF FOOD VIA AEROS

One Hundred Planes Would Have Saved 10,000 British Garrison.

A FEW aeroplanes (the reports have stated that there were not more than six machines, and photographs show that some of them are old) did some heroic work in Mesopotamia. The following despatch gives an idea of the value of these few machines:

"London, May 10—In an effort to relieve the starving British garrison at Kut-el-Amara, in Mesopotamia, British aeroplanes dropped 18,800 pounds of food, as well as mail and stores, in the town from April 11 to 29, according to Harold J. Tennant, Under Secretary for War. Mr. Tennant related in the House of Commons the story of the fruitless attempt to feed the garrison until the relief force should arrive.

"He added that during the whole siege of Kut-el-Amara the Turks brought down only one aeroplane. The pilot of this craft was killed and his observer wounded."

One hundred machines would have been able to carry a large enough amount of food to keep the 10,000 men from starving, until the relief expedition arrived. The British would undoubtedly have gladly paid any price for the aeroplanes—but they were not to be had. Great Britain has close to 10,000 aeroplanes available, the United States has about twenty. The British get daily more aeroplanes than are provided by the measures proposed for the U. S. army and navy for the twelve months ending June 30, 1917.

And yet this is the country that gave wings to the world,

America Must be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

the country which for two years held the distinction of having the only aeroplane in use for military purposes.

A Roosevelt Administration, in 1907, at a time when aeroplanes were not yet publicly known to be capable of flight, with remarkable foresight and progressiveness, drew the specifications for an aeroplane, and gave the United States Army an aeroplane—two years before any other country took a similar step.

One who looks for a solution to the problem of organizing the air service needed for national defense finds that the only hope lies in another Roosevelt Administration.

Is It Criminal Negligence?

(Editorial in Grand Rapids (Mich.) *News*)

AN interesting sidelight on the sinking of the British munition ship "Cymric" is the publication of the fact that she was carrying, among other things, 40 aeroplanes and parts from New York to Liverpool.

To the European countries now at war 40 aeroplanes are considered a mere trifle, hardly worth mentioning. France has several thousand of them and Germany as many. Russia and England have thousands.

But to the people of the United States comes the thought that more aeroplanes were destroyed in the sinking of the "Cymric" than this country possesses for both her Army and her Navy. When it became necessary to send aeroplanes into Mexico the whole aerial service was searched for machines and only eight were found that were fit to fly. They all broke down and hardly one of them is now in commission.

We are compelled to patrol hundreds of miles of Mexican border. We have not enough soldiers for this purpose and it might be accomplished by the use of aeroplanes—but we have no aeroplanes. A hungry man once said if he had some ham and had some eggs, he would have some ham and eggs. If we had some aeroplanes and an army, we would have a protective force, but we have practically neither. We are in what "Cyclone" Davis of Texas would call " a hell of a fix."

Responsibility, these days, is traced to the source, and it will not be surprising if the people of the United States soon begin accusing Congress of criminal negligence. The fact is, the people are pretty well disgusted with the Congress that can think of nothing but piffle and pork and an administration that cannot get its single-track mind off Germany's submarine activities long enough to force that Congress into the simple necessities of action demanded to protect our own citizens from slaughter.

Fifty, perhaps 20 or 30, aeroplanes could so patrol the Mexican border that an armed invasion by bandits would be practically impossible.

The aeroplane situation is rapidly developing into the proportions of a national scandal. The United States is the home of the aeroplane. The first heavier-than-air machine was perfected by an American, and the best aeroplanes ever made have been built in America. Yet we have none of them for our own defense. Europe has bought them and has improved upon them for war uses and is still buying them as fast as they can be turned out.

A sense of shame and disgust has settled down over the American people, who are loyal and patriotic, but helpless in the hands of a mess of self-seeking tinhorn politicians. Everybody, excepting the members of Congress, seems to know that this country needs aeroplanes. Everybody outside of Washington considers the aerial service a vital necessity at this stage in our national affairs.

But there is a balm in Gilead.

Patriotic citizens, well organized, but not working for money or glory, are digging into the depths of this aeroplane business and are doing what they can to interest the various states in the purchase and use of machines for the National Guard. This organization is the Aero Club of America. For two years this organization has been at work. In disgust it has given up all hope of any assistance from Congress and is now working direct with the National Guard of the various states.

Asking the guardsmen to do, with public subscription, what the Army and Navy cannot do, for lack of appropriation, the Aero Club has urged the heads of the National Guard in the 48 states to make every effort to develop this branch of the service, so as to have at least a few aeroplanes and trained men prepared to meet a possible emergency.

As a result, the New York National Guard has two fine new aeroplanes in commission. They were purchased by public subscription raised by the club and guard, and there will be two more in a short time. It is said they will all be in commission within a month.

The four aeroplanes, all military machines, are: A Curtiss biplane equipped with Curtiss OX2 100 horsepower motor; a Sloane biplane equipped for 125 horsepower, Hall-Scott motor; a Sturtevant biplane equipped with 140 horsepower Sturtevant motor, and a Thomas biplane, equipped with Curtiss OX2 motor. Since last October, when the funds raised by the national aeroplane fund of the Aero Club of America made it possible to organize an aviation detachment, 45 men have enlisted in this detachment, and a number of them have been flying and studying military aeronautics throughout the winter. With the addition of these four aeroplanes, the detachment will have a great military value.

Owing to the efforts of the Aero Club, 30 states have taken up the subject of aviation and are organizing flying corps as fast as the necessary money can be raised. The Massachusetts Naval Militia has bought two war seaplanes. The guard of Rhode Island has raised $25,000 with which to purchase aeroplanes and train aviators.

That is what the people are doing, and it is the most eloquent protest against the dallying methods of Congress that this country has ever experienced. Congress has failed the people in the hour of need, but the American people know how to help themselves. They have never been unequal to the task, and they will take care of themselves now. But it will take the people weeks or months to accomplish what Congress could accomplish in a day.

A Good Suggestion!

COL. WILLIAM JENNINGS BRYAN has been invited by the Aero Club of America to give or raise $2,500 to go with $5,000 being raised by the Club towards purchasing an aeroplane for the National Guard of Nebraska, the commanding officer of which, Adj. Gen. P. L. Hall, has telegraphed to the Club for assistance in getting an aeroplane.

The telegram, signed by Mr. Alan R. Hawley, President of the Aero Club, is as follows:

"Hon. William J. Bryan,
"Lincoln, Nebr.

"Adj. Gen. P. L. Hall of the National Guard of your State has telegraphed Aero Club of America for assistance to get a scouting aeroplane to use as a nucleus in organizing aero corps in connection with the Nebraska National Guard, to be used to protect American lives and American property against the Mexican bandits who have been raiding American communities, killing American people. An aeroplane is worth at least one thousand soldiers for patrol duty. As you know, the small, poorly equipped American Army is unable to cope with the situation. Therefore the Militia is needed to patrol the border. Lack of funds has prevented both the Army and the Militia from acquiring aero corps. Adjutant General Hall, of your State, like the heads of the Militia of other States, applied to the War Department for aeroplanes and for training officers in aviation but was told that the War Department has no funds for this purpose. The estimates for aeronautics submitted to Congress by Secretary Baker show that the administration does not aim to provide more than a fraction of the number of aeroplanes which the Army needs. No provision whatever is made for Militia aeronautics. The Aero Club of America, with funds subscribed by patriotic people, has been able to pay the expenses of sending two officers of the Nebraska National Guard to train at the Curtiss Aviation School, which trained them free of charge. We are now willing to immediately allow $5,000 towards the $7,500 needed to buy a military scouting biplane, and beg to invite you to either contribute the balance or raise it through the *Commoner*. We assure you that this $2,500 cannot be better spent. It is for the protection of American lives and American property. Kindly advise whether you wish to contribute this sum yourself or prefer to raise it through the *Commoner*.

"ALAN R. HAWLEY, *President*."

To the Point

SECRETARY of the Navy Daniels, who is engaged in a controversy with Admiral Fiske, has another opportunity for a discussion. The Aero Club of America charges the aeronautic service of the Navy is starved. The Secretary should do more work and less talking and reforming.—*Hudson (N. J.) Observer*.

POOR Uncle Sam! His wealth amounting to only $187,000,000,000 he cannot afford to supply aeroplanes to the National Guard of the three states which are doing duty on the Mexican border. So these states turn to the wealthy —in patriotism—Aero Club of America, which promptly responds to the appeals and does the Government's work. We are ashamed of Uncle Sam and proud of the Aero Club.

The News of the Week

Aeroplane Corps for Maryland

The Baltimore advocates of preparedness have planned an aeroplane corps for the Maryland militia, and in the near future one of the most modern military machines will arrive in Baltimore.

Mr. A. S. Abell, 3rd, was recently in conference with Mr. Alan Hawley, president of the Aero Club of America; Mr. Henry Woodhouse, governor of the club; Mr. Henry A. Wise Wood, vice-president; Mr. Perry Belmont, Mr. L. J. Seely, European agent for Glenn H. Curtiss, and Col. George O. Squier, in charge of the aviation section of the U. S. Army.

Mr. Abell reports that the officials of the club look with favor on the organization of a branch organization in Baltimore. The organization will form the basis of the movement to provide aeroplanes for the Maryland militia.

The machines will probably be hydroplanes, for the reason that preparedness in Maryland must contemplate the necessity of manœvres on water as well as on land.

Army Aviation News

The four R-2 type 160-horsepower Curtiss aeroplanes first ordered for the Army have been received in Texas and are about to be issued to the first aero squadron. In the meantime, the squadron has had in use four new N-8 type 90-horsepower machines recently issued to replace J-6 Curtiss machines of the same horsepower worn out during the Mexican reconnoissances. Eight more R-2 machines are to be shipped to Texas from the Curtiss factory at Buffalo about May 10. The aeroplane advisory board, consisting of Captain Virginius E. Clark and First Lieutenants Thomas DeW. Milling and Byron Q. Jones, of the aviation section of the signal corps, with Mr. Henry Souther as consulting internal-combustion-engine expert, are about to leave Washington on a tour of inspection of plants that may be in a position to manufacture aeroplane engines, other parts, and complete aeroplanes for the Army. They will visit the plants of the following companies: Sloane Aeroplane Company, Plainfield, N. J.; L. W. F. Engineering Company, Long Island City, N. Y.; Gallaudet Company, Norwich, Conn.; Eastern Aeroplane Company, Brooklyn, N. Y.; the Curtiss Aeroplane Company, Buffalo, N. Y.; Thomas Brothers Company, Ithaca, N. Y.; Sturtevant Company, Boston, Mass.; Burgess Aeroplane Company, Marblehead, Mass.; Sperry Gyroscope Company, Brooklyn, N. Y.; Heinrich Aeroplane Company, Freeport, N. Y.; Huntington Aircraft Company, New York City; Aeromarine Plane and Motor Company, Avondale, N. Y., and General Aeronautic Company, New York City. As soon as a trained personnel can be provided for it a second aero squadron will be organized at the Army aviation school at San Diego, Cal., for service in this country. In the meantime, powerful aeroplanes and accessories will be acquired for the squadron.

Naval Aviators Must Don Uniforms

As the result of an application of "ethics" the flying men of the Navy will now be seen upon the streets of Pensacola in uniform. Until recently the aviators at the flying station had enjoyed the exclusive privilege of appearing at all times off the navy yard in their civilian clothes. The order just issued, and which they must now follow, provides that the flying men must on their way to and from the yard don the uniform. Another order is placing the student aviators on duty one night each week. Heretofore, the aviators had enjoyed day working hours, but all are now being required to be on the job during the night hours once each week.

Records of Army Aviators

The Secretary of War has compiled a statement showing the flying records of Army aviators up to March 25. In the period from January 1 there were 1,604 flights; the time spent in the air by aviators was 670 hours and 39 minutes; 430 passengers were carried. The officer who has made the most notable record in flight is Lieutenant Milling, who has made 1,157 flights, with 260 hours and 50 minutes in the air; the next best record is that of Lieutenant Dargue with 580 flights in 150 hours; the third record is that of Lieutenant Carberry with 574 flights and 156 hours; Captain Foulois made 381 flights and spent 77 hours in the air. The enlisted man who has made the best record is Sergeant Ocker, with 306 flights in 109 hours.

Flying Torpedo Demonstrated

Dr. F. W. Buck, a physician of Flager, Colorado, has been conducting tests of a flying torpedo, capable of carrying and releasing 200 pounds of explosives. It is claimed that with this device, called "The Buck Automatic Aerial Torpedo," bombs can be made to drop at any predetermined spot within a ten-mile radius, by having set the timing mechanisms attached to the motor. The machine is sustained in the air by two small planes, and an 18 horsepower motor furnishes the motive power. When the calculated distance has been traversed, an automatic timing device releases the engine and torpedo, the planes falling separately.

Fithiof G. Ericson, Chief Engineer of the Curtiss Aeroplanes & Motors, Ltd., sitting in the pilot's seat of one of the famous "Canada" type machines.

Shipping box used by the Hall Scott Company. The two timbers upon which the engine case is bolted are in turn bolted to the center bed timbers in the box. The ends of the box are removable, enabling two men to remove the motor.

Personal Paragraphs

F. H. Prince, Jr., who went over to join his brother, Mr. Norman Prince, who is distinguishing himself in the aviation corps, has been sent to the front after serving his time in the training school of the same corps.

Jack Tweed is to be one of the instructors at the aviation school at Essington, Pa., this summer.

Aviator Beryl J. Williams, who has just arrived in this country from Japan, states that he has been commissioned to purchase six machines for the Chinese revolutionists.

Test for Junior Military Aviator Certificate

We have had several requests to reproduce the conditions of the test for the Junior Military Aviator Certificate of the United States Army. They are as follows:

(1) Five figures of eight around pylons 1,600 feet apart, keeping all parts of machine inside circle where radius is 300 feet.

(2) Climb out of field 900 by 900 feet, keeping all parts of machine inside of square until 500 feet altitude is reached.

(3) Spiral down from 3,000 feet with dead motor, change direction of spiral on way down and land within 150 feet of previously designated mark.

(4) Land with dead motor in a field 800 by 100 feet, assuming field to be surrounded by 10 foot obstacles.

(5) Land from 500 feet with dead motor within 100 feet of previously designated mark.

(6) One triangular flight of sixty miles (triangular with a perimeter of 60 miles) flight by compass and maps.

(7) One straightaway cross-country flight of ninety miles, landing at end, by compass and maps.

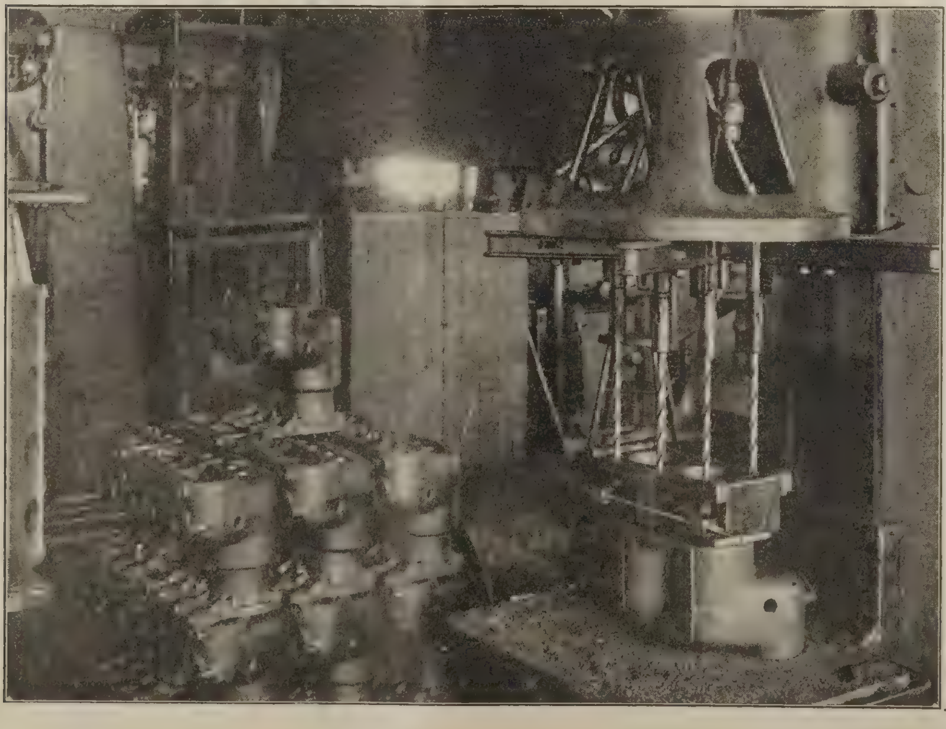
The Norma Company of America Elects New President

At the annual meeting of The Norma Company of America, held recently in the offices of the concern in New York City, Mr. W. M. Nones was elected president and treasurer. Prior to this, Mr. Nones was secretary-treasurer, as well as general manager, of the company; and in his new position he will continue to exercise the general management of the firm—which has, in five years, grown from a small import business to a commanding position among the American manufacturers of ball, roller, thrust and combination bearings.

Chicago Activities

On May 16 at the annual banquet of the Chicago Navy League an aeroplane exhibition and talk was given by Mr. Arthur E. Nealy, Assistant Secretary of the Aero Club of Illinois. Small models of large machines were flown and military types exhibited, the models coming from the Illinois Model Aero Club. Bomb dropping from a tiny aeroplane was the feature of the demonstration, many "bombs" descending upon the unprepared, preparedness enthusiasts of the Navy League. Mr. Nealy was assisted by Mr. Geo Weaver.

The hangars at the A. C. I. Ashburn Flying Field are rapidly nearing erection, some of the smaller ones being already completed and occupied. The Champion Co. has located at the new field and has started training students. The Partridge Aviation Co. has been flying upon every good day for the past two weeks. The Laird Aviation Co. announce their intention of removing to the new field immediately and will first test out the light eighteen-horsepower tractor which is to be put on the market later in the year.



This photograph shows a Thomas 135 h.p. Aeromotor twin cylinder casting set up for drilling the holding down holes on a Bausch multiple spindle drill. A self centering jig locates itself by means of two hardened steel V blocks which rest on the outside of both cylinder barrels, and by means of hardened steel bushings insure the accurate drilling of the cylinder feet in proper relation to the outside of the cylinder barrels.

Aeroplanes to Co-operate with Fleet

The Navy Department has announced that a division of cruisers of the Tennessee class will shortly be added to the Atlantic fleet, to be fitted with aircraft and act as scouts for the battleships.

Each of the cruisers will carry at least four aircraft, and each ship will be fitted with a special catapult device for launching aircraft at sea.

In the reorganization plans which become effective on May 15, the fleet will be divided into four squadrons of battleships and eight divisions. The numbers of each division will indicate when the ships comprising that division became part of the naval forces, the older ships comprising the first division and the newest dreadnoughts making up the last.

Military Aviation News

On April 25th a board convened to conduct the tests for certificates of Junior Military Aviator. The members of the board are Captain Fred W. Palmer, Medical Corps; Captain Arthur S. Cowan, Signal Corps; Captain Ray W. Bryan, Medical Corps; Captain Frank P. Lahm, Aviation Officer, Signal Corps; and Lieutenant Harry Gantz, Aviation Officer, Signal Corps.

The tests began April 28th. The officers taking the test for this grade are Lieutenants Curry, Richards, Royce and Brown.

Sergeant Albert D. Smith, Signal Corps Aviation School, who is on furlough, has been making some notable flights at Los Angeles, in a new type military tractor built by the Glenn Martin Company, of that city. Sergeant Smith, on February 19th, established a new hydroplane record of 8 hours and 42 minutes in a Martin "S" type Hall-Scott motored seaplane.

Among the visitors to the school who made flights as passengers were Ensign W. H. A. Pike, U. S. N.; Ensign Graham, U. S. N.; Lieutenant Minnis, U. S. M. C.; Lieutenant Murchisun, U. S. M. C.; Lieutenant Pegram, U. S. N.; Major Pillsbury, Engineer Corps; Lieutenant Hicks, 6th Field Artillery; Ensign Wiltsey, U. S. N.; and Lieutenant Caldwell, 9th Cavalry.

Stinson Activities

On April 28 Edward Stinson, of the Stinson School of Aviation, flew over San Antonio, as a surprise element in the local celebration of Flower Day. While the "Battle of Flowers" was in progress, the aviator dropped flower bombs on the contestants.

On May 13 Miss Marjorie Stinson flew over San Antonio in conjunction with the rounding up of the local National Guard preparatory to their leaving for the border. Very real interest was evinced in her flight.

The Stinson School of Flying graduated its first private San Antonio pupil. He was John Frost, who became interested in aviation some time ago. "Private" is used as distinguished from students of the city who have been connected with the militia.

Edward Stinson, one of the instructors at the Stinson School of Aviation.

Mr. Frost's instructors say that he did most creditable work. He made his final test flight in a special Stinson school model machine, which is virtually an improved Wright. The flier was made in the school machine shop and has been in commission since April 18. Frost is taking a post-graduate course.

Another pupil, Wellington C. Ault, graduated on the same day. His home is at Ottawa, Ontario, Canada. Arthur Haywood, of the same place, graduated May 12th.

Two new pupils recently entered the school. They are a Mr. Bartlett, of Bartlett, Tex., and Mr. Geegeeboy, of India. He is a native of that country and came here especially to study aviation.

Four aeroplanes are under construction at the Stinson School. Three of them are tractors for the "flying trio" of the Stinson family—Miss Katherine, Miss Marjorie and Edward. The other is for school use.

Interior view of the plant of the Van Blerck Motor Company, at Monroe, Michigan.

A Good Example

The Aero Club of New England, stimulated by the progressive attitude of its worthy President, Mr. Godfrey L. Cabot, is doing an excellent work in advocating aerial preparedness. At a recent meeting of the Boston Chamber of Commerce, the following motion, made by Mr. Cabot and seconded by Mr. J. Randolph Coolidge, Jr., was unanimously carried: "That the Boston Chamber of Commerce recommends to the National Chamber of Commerce that Congress be urged to provide adequate defense in the air, both over the land and over the sea." An excellent example for every Chamber of Commerce of every city in the United States.

Timm with Grinnell Co.

Otto W. Timm, the North Dakota aviator, has joined the Grinnell Aeroplane Co. as an instructor. He is also at work on a new design looping machine, which will be equipped with a 100 h.p. Robinson radial motor.

Pennsylvania News

The close of the Drexel-Biddle campaign, which ended the middle of May, also brought to a finish the publicity campaign of the Aero Club of Pennsylvania, which occupied a most prominent place in the preparedness exhibit which was held in the Widener Building for nearly three weeks. During the early part of the affair the Glendinning flying boat was on exhibition, and when this was removed, due to the opening of the Philadelphia School of Aviation, of which Mr. Glendinning's boat is part of the equipment. The next exhibit was a Bleriot type monoplane, built by Mr. Geo. C. Peddle, of Philadelphia.

A determined effort to have an aerial instruction station in Philadelphia, as the main station for the aerial squadron of the Coast Guard proposed in Legislature before Congress, will be made by the club, according to Mr. Wynne, one of the directors and an ex-president. "We already have established an aero station at League Island," said Mr. Wynne, "and a more ideal location could not be found. The spot is remarkably adaptable to both land and watercraft. The Coast Guard would have the benefit of the improvements we have made, and close by are the repair shops of the League Island Navy Yard should any repair work be necessary. All these things give us what I consider the strongest endorsement for establishing the main station in Philadelphia any place could offer."

If plans now under discussion by the club go through, the League Island grounds will be made headquarters and training school for an anti-aircraft corps. In addition to its training school for aviators on the League Island field, it is proposed to give instruction in the use of operating small machine guns against aircraft and also the use of large guns in this class of warfare.

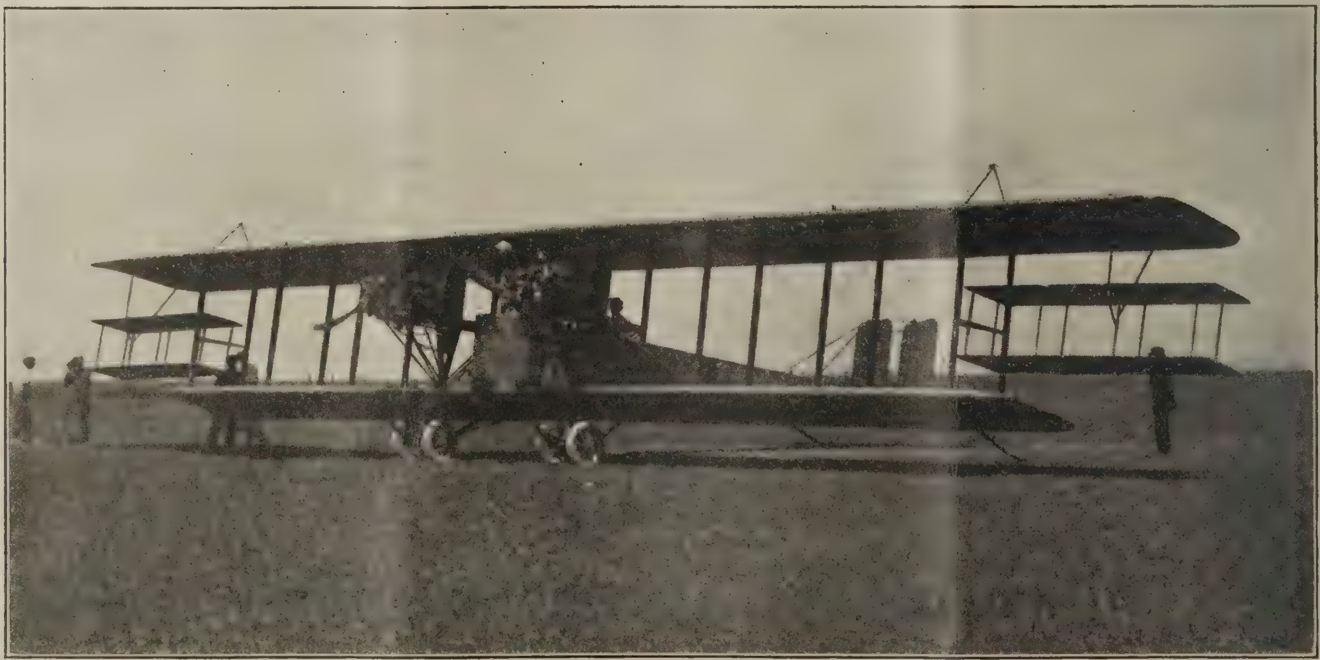
It is probable that some of the rapid-fire guns now at the yard will be converted into anti-aircraft pieces by remounting and equipping them with special sights and other devices. When the aviation school opens the men on the battleships and marines of the yard will be drilled daily in the use of the guns. As soon as a plane ascends, the members of the newly formed corps will go through all the movements incident to firing. It is hoped to develop a highly efficient body, capable of either operating with the fleet or with an army in the field.

At the formal opening of The Philadelphia Aviation School at Essington on May 12, Admiral Robt. E. Peary stated that it is possible for the United States to have the best aviation corps in the world. After discussing the value of an efficient aviation corps to a country in time of war, Admiral Peary told why the young men of America should make aviators of the first class. "As in France," he said, "I think that in this country there is to be found an abundance of that type of courage and daring so necessary in the make-up of a military aviator." Admiral Peary then told of the value of aviation schools as a step toward national preparedness. "If we teach a sufficient number of our young men to fly," he continued, "in case of need it would be easy enough for us to turn out the machines. The machines would be a secondary consideration if we had the flyers."

The school which was originated by Robert E. Glendinning was opened with a flight by the two instructors. Besides Rear Admiral Peary the flight was witnessed by several city officials and local naval officers among them being Mayor Smith and Commandant Russell, of the League Island Navy Yard.

A regular meeting of the club was held in the Bellevue-Stratford, evening of May 12. A large number of members and guests were present. Mr. Kays, chairman of a special committee on aviation schools, reported that he had visited a certain school which had been widely advertising in the daily papers, and that through his efforts a U. S. Postal Inspector had called upon the school, had notified them to discontinue their advertising which they agreed to do. Their circulars were destroyed and the school was obliged to discontinue business.

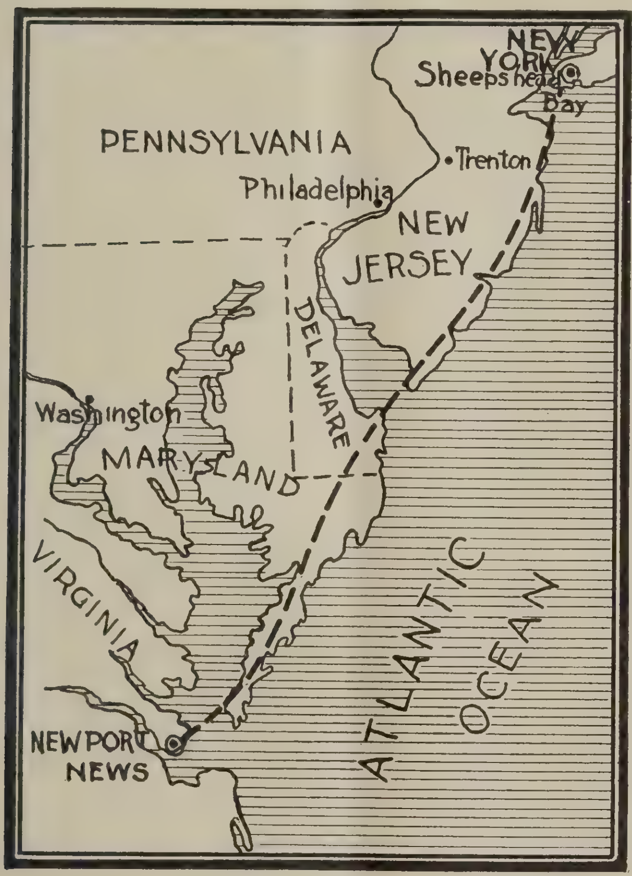
June 17 is Annual Navy Day at the League Island Yard, and Mr. Wynne, of the Special Committee, reported that he is in negotiations with several aviators for a number of machines and expects fully four or more in the air at once. Mr. Wynne has promised the finest exhibition of flying ever seen in Philadelphia. The members of the club are requested to assemble on the aviation field at 4 P. M. on the above named date. It was also announced that on June 27 another flying event was being arranged to take place, this date being Navy Day for the Convention of the Associated Advertising Clubs of the World.



The twin-motored Andermat Cruiser Aeroplane, built by the Andermat Aeroplane Co., at Sunnydale, Cal., which has a wing spread of 72 feet. It weighs 5,000 pounds, and has 975 square feet of lifting surface. It is propelled by two Andermat twin-four V-shaped motors, which develop 120 h.p. each. The machine has a flying radius of 400 miles.

NEWPORT NEWS TO NEW YORK BY AIR—ACTIVITIES AT SHEEPSHEAD BAY

WITHOUT a stop in his flight of 400 miles, Victor Carlstrom piloted the twin-motored J. N. Curtiss military tractor from Newport News, Va., to New York in four hours and one minute. He established a new record for cross-country flying in America, won a special prize of $1,000 for the greatest distance flown in reaching the Preparedness Tournament at Sheepshead Bay, and set a pace for the airmen who will enter the cross-continent competition in September for the Pulitzer trophy and $100,000 of prize money being raised by the Aero Club of America.



Carlstrom carried 104 gallons of gasoline and a 200-pound passenger, Capt. Ralph L. Taylor, of the Connecticut Coast Artillery, who is one of thirty-two military aviators being trained at the expense of the National Aeroplane Fund.

The two contestants flew so fast that their arrival at the Speedway occurred early in the morning, long before any spectators had arrived for the opening of the show, which was at half-past two in the afternoon. That fact deprived the tournament's opening session of what would have been otherwise its most spectacular event.

Stephenson McGordon, who also made the flight from Newport News, arrived at Sheepshead Bay forty-nine minutes after his rival. He carried with him Max Goodnough. Carlstrom and McGordon reported that they had flown practically in company until they ran into a thunderstorm while speeding over Chesapeake Bay early this morning. They then became separated, and McGordon for a time lost his bearings in the clouds and fog. The winner arrived at the Speedway at twenty-seven minutes after nine o'clock, and McGordon at sixteen minutes after ten.

Both aviators used Curtiss biplanes of different types, Carlstrom driving a twin tractor machine of 180 horsepower, while McGordon piloted a single motored aeroplane of the Curtiss military model R, developing 160 horsepower. When caught in the thunderstorm the aviators were flying at an altitude of five thousand feet, but McGordon lost time later by having to come lower to get his bearings. Both men made their start at twenty-six minutes past five o'clock in the morning.

A message sent with the winning aeroplane beat the delivery of a telegram sent simultaneously with the start addressed to the headquarters of the Aero Club of America in this city. It was sent by Captain Thomas S. Baldwin, who has charge of the Atlantic Coast Aeronautical Station at Newport News, Va., and was addressed to Alan R. Hawley, president of the Aero Club. The message said:—

"My Dear Mr. Hawley:—I am sending you this message by Carlstrom and McGordon, who will show to-morrow morning what air transportation really means. By boat and rail, making the most direct connections now possible between Newport News and New York, we took thirteen and one-half hours to accomplish the journey that our airmen expect to make in about four hours. The all rail distance via Richmond, Washington and Philadelphia, is 416 miles. The actual running time of the fastest passenger trains is nine hours and fifteen minutes. The route chosen by Carlstrom and McGordon reduces the distance possibly to four hundred miles. I expect they will drive the two Curtiss tractors, one of them a new twin engine machine of a new type, without making a stop in the four hundred miles.

"To-morrow's performance should show what may be expected from the trans-continental aeroplane competition which the Aero Club has instituted upon suggestion of Mr. Ralph Pulitzer."

The previous American cross-country record was made by W. C. Robinson, who flew from Des Moines, Iowa, to Kentland, Ind., on October 17, 1914, making the distance of 332 miles in four hours and forty-four minutes.

There were no other competitors in the cross-country race. It had been reported that another aviator was to start from Ithaca, N. Y., but the tournament management late in the afternoon said they had heard of no other starters than the two Curtiss flyers from Virginia. "Tex" Millman, flying his fast little monoplane, with a spread of only eighteen feet from tip to tip, ran over from Hempstead Plains, a distance of about eighteen miles, arriving at the Speedway in sixteen minutes, according to the announcer. Though he was not in the race competition, Millman gave an exhibition, flying several times around the track.

Just before the close of the afternoon program Carlstrom and McGordon also displayed their big biplanes in an impromptu race of five laps, or ten miles, around the oval, each carrying a passenger. Carlstrom's companion was Mr. Hawley. No official time was kept for the event, but several of the two-mile laps were announced to have been made in one minute and forty seconds. McGordon finished a few hundred feet ahead of Carlstrom, though the two machines throughout the exhibition flew close together, one soaring at times almost directly above its mate, furnishing the prettiest picture of the tournament's first day spectacles.

U. S. ARMY SPECIFICATIONS FOR MILITARY AEROPLANES

I. PRELIMINARY: This specification describes the design, construction, equipment and requirements of a military aeroplane adapted to land reconnoissance.

II. GENERAL REQUIREMENTS: The folowing characteristics shall be proven to the satisfaction of the inspectors appointed by the Government for that purpose.

(*a*) This aeroplane shall be a two-place tractor biplane with one fuselage, and shall be equipped with one motor. It shall be suitably constructed for carrying a pilot and one passenger, and shall be designed for carrying a useful load comprising the following:

1. Pilot and passenger....................................330 lbs.
2. Instruments and equipment..........................150 lbs.
3. Supply of gasoline, oil and water necessary for a flight of six hours' duration, with motor turning continuously the number of revolutions per minute required for its rated horsepower. The RATE OF FUEL CONSUMPTION may, at the discretion of the inspectors, be based upon a flight of two hours' duration with motor turning continuously the number of revolutions required for its rated horsepower. There need be only one such flight for the entire group of machines.

Unless otherwise specified in the order, the useful load carried on all performance tests shall be equivalent to the above.

(*b*) The motor shall be a Hall-Scott, 6-cylinder, 125 horsepower, internal combustion engine.

(*c*) The safe horizontal low speed shall not exceed forty-six miles an hour.

(*d*) At the discretion of the inspectors, at least one machine of the group delivered, to be chosen at random by the inspectors, to attain an altitude of not less than 10,000 feet above sea level, starting with the above useful load.

(*e*) The airworthiness and general flying qualities of the aeroplane to be satisfactory. These include celerity of responses to control; the proper degree of symmetric and asymmetric stability (static and dynamic); steadiness in disturbed air, etc., under various flying conditions.

In order to determine these attributes, an army pilot may, at the discretion of the inspectors, fly any or all machines, executing sharp figures of "8," dives, stalls of various kinds, side-slips, sudden stopping of motor while climbing steeply, releasing of controls for a period of time after the machine has been steadied in horizontal flight, and such other maneuvers as he may deem necessary to determine the general suitability of the machine.

(*f*) Standard Curtiss control shall be installed in the rear cockpit (shoulder or chest yoke). Provision shall be made for dual control. The control shall not be installed in the front cockpit, but will be furnished complete and ready for installation. The action of the controls shall be positive, reliable and give a proper power ratio. The lateral control shall be double acting.

(*g*) INSTRUMENTS AND ACCESSORIES: The following instruments and accessories shall be provided. Their location, design and arrangement shall be such as to cause them to function with satisfactory precision and reliability under various flying conditions.

1. Aneroid barometer, graduated in feet; registering from sea level to 12,000 feet; to be installed in rear cockpit.
2. Clock in rear cockpit.
3. Two Sperry compasses and one synchronized ground drift indicator. The ground drift indicator to be in forward cockpit and connected to both compasses, one in each cockpit.
4. Two three-pint water bottles, one installed in each cockpit.
5. Case or box for tool kit, to be installed immediately in rear of the pilot and readily accessible.
6. Two map cases. Rolling map case in rear cockpit. Folding shelf map desk in forward cockpit.
7. Shaft revolution speed indicator, to be installed in rear cockpit (Warner tachometer preferred).
8. Gasoline supply gauge in rear cockpit.
9. Oil supply gauge in sump, to be visible from rear seat.
10. Radiator water thermometer, visible from rear seat.
11. Throttle control (both hand and foot, if control permits) to be installed in rear cockpit, and also provided ready for installation but not installed in forward cockpit.
12. Ground wire switch to be installed in rear cockpit, and also provided ready for installation but not installed in forward cockpit.
13. Carburetor adjustment, control for altitude (if necessary) to be installed in rear cockpit.
14. Spark advance control to be installed in rear cockpit.
15. Pressure indicator for gas system, visible from rear seat.
16. Compression release in rear cockpit.

(*g*) MOTOR INSTALLATION: The ease and convenience of removing motor from, and installing motor in aeroplane, with a minimum disturbance of connections, controls, structure, etc., shall be satisfactory for field service. The housing around the power plant should be readily detachable, and, in addition, have means to permit convenient access to all parts of the motor which may require adjustment or inspection.

(*h*) GASOLINE TANKS: A gravity feed tank capable of holding a supply sufficient for at least forty minutes' running at full rated horsepower of the motor to be securely installed in such a place that the feed shall be positive, reliable and sufficient in all flight altitudes up to 30 degrees inclination, either climbing or gliding.

(*i*) FUEL SUPPLY SYSTEM: If gravity feed is not used throughout, a positive and reliable system of pumping gasoline from the reserve tanks to the gravity tank shall be provided.

(*j*) SERVICE PIPES AND CONNECTIONS: Gasoline, water and oil service pipes and conections to be proof against vibration. A positive means of cutting off the gasoline supply at the service tank shall be readily accessible from both seats.

(*k*) TO STOP MOTOR: At least one reliable method of stopping the motor shall be provided, capable of operation from either seat.

(*l*) CARBURETION AND OIL FEED WITH MOTOR TILTED: The oil supply system, carburetion, etc., shall be such as to permit the motor running satisfactorily at angles of inclination up to 30 degrees (either way) to the horizon.

(*m*) BACK FIRE PROTECTION: Positive and reliable means should be provided to prevent backfire spreading beyond the carburetor. This shall be effective for all flying conditions and altitudes of the machine, including that of motor running while upside down.

(*n*) VIBRATION: The vibration at various motor speeds, and under various conditions, must not be excessive.

(*o*) ASSEMBLY, DISASSEMBLY AND PACKING: The provisions for rapid assembling and disassembling, and for packing in crates of convenient size and shape for transportation, shall be satisfactory. Detachable bolts, fittings and other parts shall be as few in number and as simple as is consistent with other requirements.

(*p*) INSPECTION FOR DEFECTS: FAULTY CONSTRUCTION, POOR MATERIAL, ETC., BROUGHT OUT IN TESTS: An inspection of a machine immediately after any test to show that all parts and connections of the power plant and of the aeroplane are in good condition.

IV. THE PROPOSAL OF THE MANUFACTURER WILL INCLUDE GUARANTEES RELATIVE TO:

(*a*) Performances under Paragraphs II, i. e., load, low speed, factor of safety, etc.

(*b*) Paragraph III; i.e., additional desirable features.

(*c*) The following:

1. THE CLIMB: The manufacturer will guarantee that under conditions as set forth under Paragraph II-a and V, his machines will attain an altitude of not less ———————— (to be filled in by manufacturer) feet in ten minutes.
   Note: The barograph records will be corrected for calibration errors only.
2. HIGH SPEED: The horizontal high speed to be not less than ———————— (to be filled in by manufacturer) miles per hour.
3. The periods of time required to complete each machine ordered. The time specified shall include date of receipt of order, and date of delivery of each machine. By DATE OF DELIVERY, for each machine, will be meant the date on which the machine will be ready for officially observed tests at an aerodrome provided by the manufacturer (unless otherwise specified in the order). (See requirements for speed course under V). The purpose of this provision is to insure the manufacturer's having completed his preliminary and experimental tests and having each machine in a state for acceptance tests by the date of delivery guaranteed by him.
   A penalty of three-tenths of one per cent of contract price will be imposed for each day required over and above the time specified in the order. The only allowance for delays will be due to strikes, riots, fire, or other disasters, or other causes which are clearly not the fault of the manufacturer.
4. PRICE OF:

(*a*) Each machine complete with motor and propeller.

(*b*) Each component aeroplane part.

A complete list with proper designating numbers and prices shall be included.

(*c*) Spare motors, complete, without radiator or propeller.

(*d*) Each component motor part.

A complete list with proper designating numbers and prices shall be included.

All guarantees shall be so worded that it will be unnecessary to re-write the guarantees should order be placed. Example: "If order for aeroplane (or aeroplanes) to be constructed in accordance with Signal Corps specification No.... is placed with me (or name of company), I hereby guarantee, etc...."

Suitable crates and boxes for transportation shall be furnished by the contractor and all work and material incident to shipping the aeroplane, its accessories, and spare parts to destination specified in the order shall be provided by the contractor. Shipment will be made on government bill of lading, unless otherwise specified in the order.

V. TESTS: Any or all of the following rules governing the method of conducting performance tests may be enforced, at the discretion of the inspectors:

(*a*) Any or all machines must pass any or all tests to demonstrate guaranteed performances, and to demonstrate that all provisions of this specification have been complied with.

(*b*) All tests shall be started at approximately sea level.

(*c*) For all tests the power plant and aeroplane shall be identical in every detail with the arrangement it is proposed to use in practical service in the field.

(*d*) The same type propeller, the factor of safety of which is satisfactory, shall be used for all tests.

(*e*) The motor shall not be driven during any performance test at a speed greater than 1,400 revolutions per minute.

(*f*) The gasoline used to be of a grade, which, in the opinion of the inspectors, is readily obtainable in field service. By this is meant standard automobile gasoline testing not higher than 65 Beaume.

(*g*) The number of officially observed attempts for each performance shall be decided upon by the inspectors at the time of the tests.

(*h*) Before arriving at the starting point for each of the speed tests, machines must be flown at a height of not more than 25 feet for a distance of not less than 900 feet. The original altitude must be maintained over the specified course from start to finish.

(*i*) The location and length of the course for the speed tests shall be decided by the inspectors. The course for the speed tests should be level and be between 1,000 and 2,000 yards in length. The location, length and suitability of the course, if one has already been chosen by the manufacturer, before the commencement of the official tests, must meet with the approval of the inspectors.

(*j*) The period of time for the climb shall start at the instant the wheels leave the ground for flight.

(*k*) Climbing and speed tests shall be made by a pilot in the employ of the company.

(*l*) Stopwatches, barographs, and other instruments necessary for measuring the speeds and the rate of climb, shall be provided by the Government. The fuel and oil shall be supplied by the manufacturer and shall be subject to test by the inspectors.

(*m*) The inspectors may, at their discretion, prohibit unreasonable delays in performance tests, caused by adjustments in power plants or aeroplanes which would not, in the opinion of the inspectors, be practicable in field service, or which should have been made before the date of delivery as defined under IV. c. 3.

VI. INSPECTION AT FACTORY DURING CONSTRUCTION: One or more designated representatives of the Government will be present at the factory druing the construction of aeroplanes ordered.

(*Continued on page* 344)

TO NEW YORK BY AIR IN FIFTEEN HOURS

By Claude Grahame-White

IT was in 1903, thirteen years ago, that the Wrights first flew; in 1908, eight years ago, Farman made the first cross-country flight, and in 1909, only seven years ago, Bleriot passed from France to England by air.

Today there are thousands of airmen flying instead of only a few—naval and military, professional and amateur; and a modern-type aircraft, by the use of swept back planes, uptilted wing-tips, and scientifically designed fins, is given stability which is inherent, and tends to make her mistress and not the plaything of the gusts she rides.

Flying is now possible in a gale of wind, and without exhaustion for the pilot. As gusts strike a craft she will swing to them and regain her balance; and, should a furious windrush thrust her over, she will drop some distance, then right herself automatically. The airmen in such a craft as this, once he is aloft, occupies himself mainly with his rudder-bar, shifting this occasionally to keep his machine on its course.

Aero-motors nowadays, built with growing experience and skill, do not fail often; but, even should the engine stop in mid-air, a pilot need as a rule have no concern. Bringing gravity to his aid, he begins a glide earthward, and if he is flying high—as he should be when passing across country—he will be able to plane for several miles before he touches ground. While he glides thus his craft is under perfect control. He can steer to right or left, or turn in the air, and has no difficulty as a rule in finding a suitable landing point.

But descents, owing to engine failure, should soon be obviated. Already machines are built and flown which have a duplicate power-plant; and this means that, should one motor give trouble and cease to do its work, there are others running which are independent of it, and will continue to sustain the craft in flight. With the many-engined aircraft of the future a risk of mechanical breakdown will be reduced almost to vanishing point.

What we need are engines of greater power, because with them we could build larger, heavier and faster flying craft. Test work in this field is costly, however, and cannot be accomplished in haste; hence aeroplane constructors need patience. But the demand for higher power that has been created by the war, and the fact that money is spent freely on aircraft by combatant nations, serves as a great stimulus to production. In the future, instead of being reckoned in hundreds, the horse-power of aero engines will have risen to thousands, and then will dawn the era of large aircraft, carrying passengers, mails and goods, at speeds impossible by land or sea.

Twenty years hence we should cross the Atlantic by air, by means of a regular flying service, in a journey, say, of fifteen hours. Passenger craft of the future will have widespread multiple planes, and a slim, delicately tapered hull.

A voyager in their cabins, borne through the air with vibrationless ease, will be able to step aboard near London, say, on Friday afternoon, and find himself in New York on Saturday morning, having eaten and slept in comfort unconcerned by the knowledge that he is thousands of feet aloft. On Sunday afternoon he will re-embark—should he be in haste to return—and alight in England again on Monday morning.

Journeys between the capitals of Europe will be simplified enormously. Business men, who pass constantly between London and Paris, will find that his journey has lost its inconveniences. They will be able to attend their offices in London in the morning, opening letters and dictating replies. Then, leaving by the noon air-mail, they will lunch on board—with no change to be made from train to boat and back again to train—and find themselves in Paris with time for an afternoon of business calls; returning to London by an evening air service, and having ample time to sign the letters at their offices as an end to the labors of the day.

No insuperable difficulty bars the progress of aviation. Problems remain to be solved, but none so great as was the initial one of actual flight. The essential facts have been demonstrated; a machine will ascend and fly for many hours and combat a gale of wind; and the rest is a matter of evolution—the improvement and perfection of apparatus.

One problem designers must solve concerns the wing-area of a machine—the spread, that is to say, of its sustaining planes. To raise a heavy load from the earth when a craft is gathering speed a large expanse of lifting surface is required. But once the machine is well aloft, with its motors thrusting it rapidly through the air, a wide spread of planes is no longer needed. As the surfaces pass more quickly through the air, their lifting power increases.

What is needed, once a machine has reached its flying height, is a means of reefing or telescoping the planes. Then, when the motors are devloping thir maximum power, the wing surfaces may be set at the minimum needed for sustaining the craft and crew, with a result that the highest speed will be attained and there will be the smallest possible wastage of power.

Difficulties present themselves in the reefing or reducing of surfaces; but, with the craft of the future, the planes of which will be of metal, there may be panels made to slide to and fro, and so give the required changes of surface.

Another problem is that of wind pressure. At high speeds, as those who have driven fast in motor-cars will know, the sheer resistance of the air, to any object moving through it, may reach a surprising force. At a pace, say, of 200 miles an hour, which aircraft of the future should attain, science in the shaping of hulls will have been brought to perfection. Smooth surfaces of metal will be employed; there will be no projections to catch the air; the body of machine will taper from bow to stern; and in its every line and curve it will suggets the grace of speed.

The development of a high-speed aircraft is of vast importance to the world, and for this reason the world's demand is all for quicker transit. Time represents money, and has a greater value day by day. Men want to travel faster when they journey on business; the world of commerce seeks to send its goods more quickly; and there is a demand always that the dispatch of mails should be speeded up. Yet the steamship and the train, though they have responded so often to the call, seem to have reached a limit; to gain even a knot here or a minute there has become a crucial problem.

Here lies the future of the aircraft. Hitherto, when they have made their journeys, men have been restricted to land or sea. But now they have vehicles that will carry them through the air; and for the air as a highway there is this advantage to be claimed. It extends, free and unobstructed, over the whole of the earth's surface. The airways will need no laying of rails or boring of tunnels; and passengers by the air mails will not—like those who travel by train—be asked to change from their saloons to a steamship when the brink of the sea is reached. By air, speeding straight from point to point, all the obstructions of our earth-bound traffic may be ignored—mountains, forests, rivers or seas.

Twenty years hence the air will be peopled by craft large and small, flying high and low; swift passenger machines and slower goods-carrying craft; grim gray war machines, and aero-mails; with thousands of privately owned craft that will be driven either for business or pleasure.

Both day and night along the highways will sound the drone of high-speed craft. During the daytime, glancing below, pilots will be guided on their course by gigantic land signs; and in the evening, as soon as darkness falls, there will be flashes of light from signal-towers, each route and each alighting ground being distinguished by a difference in the frequency and color of the beams thrown skyward.

The constructor of aeroplanes, in the meantime, labors to remove their limitations. Yesterday he was spoken of as a "crank"—an amiable but futile enthuiast. But today, remembering the vital part that has been played by aircraft in the war, he is regarded with respect. And tomorrow, when he has perfected a metal-built craft that will vary its speed by an alteration of wing-surface, and is fitted with duplicate engines developing thousands of horse-power, he will proceed to revolutionize the traffic of the world.

THE ANNUAL AIR DERBY

THE transcontinental air race for the Ralph Pulitzer trophy and added cash prizes, announced last week by the Aero Club of America, will start from New York September 2—the Saturday before Labor Day.

Plans for this National Aerial Derby, which may be varied from year to year as the Aero Club decrees, made stronger appeal to official and scientific interest and to popular imagination than any other aviation event since the infant days of flying.

As a measure toward national preparedness the long distance flying classic is welcomed by all those who have wished that something might spur America to regain its place in the air. As an event of sportsmanship and a test of aerial engineering development, the transcontinental race comes as the long awaited call.

The Wright Company promised to enter two machines, the Curtiss Company two or more, the Glenn L. Martin Company of Los Angeles two and probably three, the Federal Aircraft and Motor Corporation of New York two.

Frederick C. Hild, who has flown for the French Army in the war and is now secretary of Eastern Aeroplane Company of Brooklyn, communicated to *The World* that his company would enter at least two machines, and that one would be piloted by Mr. Hild himself.

Other construction companies offering to co-operate and enter at least one machine are:

Andermat Aeroplane Company, San Francisco.
Burgess Company, Marblehead, Mass.
C. & E. Aeroplane Company, New York.
Christmas Aeroplane Company, Washington, D. C.
Gallaudet Company, Norwich, Conn.
L. E. P. Aeroplane Corporation (Polson Iron Works), Toronto, Canada.
L. W. F. Engineering Company, Long Island City.
New Jersey Aeroplane Company, Paterson, N. J.
Sloane Manufacturing Company, New York.
Thomas Brothers Aeroplane Company, Ithaca, N. Y.

Among the professional flyers who have indicated their intention of entering the competition are:

Robert G. Fowler, who made the first transcontinental flight in 1911.

Oscar A. Brindley, Los Angeles, who won the Curtiss marine flying trophy in 1915.

Baxter Adams, an exhibition flyer of the Curtiss School at Hammondsport.

E. J. Jaquith, who has made 2,000 ascents without one accident.

The Aero Club officials are waiting until details of the transcontinental plan shall be disseminated in the Far West before attempting definitely to determine the route.

Two types of triplanes, designed to have a speed of from 110 to 130 miles per hour, have been entered in the contest by the Carter Bros. Aeroplane Company, of Hyattsville, Md., subsidiary of the Carter Bros. Motor Company, of Detroit, builders of motor cars and trucks. Howard O. Carter, in making the entry, furnished to the Aero Club the following specifications of the machines entered:

"Carter triplane, type A, 16 cylinders, 300 horsepower, double motored (Carter patent drive), speed 110 miles an hour, two passengers.

"Carter triplane, type B, 24 cylinders, 420 horsepower, double motored (Carter patent drive), speed 130 miles an hour, two or three passengers."

The New York Aero Construction Company, by Cecil H. Upper, president, sent notice that it would enter two tractor planes equipped with twin engines developing 180 horsepower, and having a flying radius of ten hours. Warren H. Eaton, constructing engineer, now building these machines, will have charge of the flight for that company.

CONSTRUCTORS' COMMENT

From Orville Wright

A prize for a transcontinental flight under conditions difficult, but not impossible of fulfillment, should prove a stimulant to aviation and a step toward preparedness. I have not yet learned the conditions of this contest, but I feel sure that Mr. Pulitzer is putting up a prize with the intenion of having it won. I hope the offer of the prize will result in an interesting contest.

The Wright Company

The Wright Company will gladly enter two fast machines to compete in the proposed coast-to-coast race. Every effort will be made to assist in making this the world's greatest competition. We believe this to be the supreme test for efficiency and durability and will undoubtedly be the direct means of bringing out the best talent in aviation.

THE WRIGHT COMPANY,
Edward M. Hagar, President.

The Burgess Company

We heartily indorse the transcontinental competition made possible by Mr. Pulitzer through the auspices of the Aero Club. It is only through the public spirit of such enterprises that American aviation will regain the lead it once had and demonstrate its possibilities in peace as well as in preparations against war. We shall certainly hope to have the opportunity to compete.

THE BURGESS COMPANY.

Thomas Bros. Aeroplane Co.

The transcontinental aeroplane competition for the Pulitzer trophy should prove a distinct aid in awakening the people of this country to the necessity of preparedness. Only through the people can we expect to bring Congress to a realization of the tremendous importance of aeroplanes to our Army and Navy. It would also prove of incalculable value to the advancement of aviation in America.

You may count on our full support in this contest, in which we will doubtless enter one or more machines.

THOMAS BROTHERS AEROPLANE CO.,
By W. T. Thomas, President.

Sloane Mfg. Co.

We heartily approve of the proposed transcontinental flight, for we believe this would arouse an interest in aviation by the people of our country, demonstrating to them the value of aeroplanes, emphasizing their absolute necessity in time of war, and eliciting active popular support for an adequate service for defensive as well as offensive work.

In 1912 a public subscription in France of over 6,000,000 francs gave France 208 aeroplanes, 65 landing stations and 75 aviators. In 1914 the French Government increased this to 1,200 aeroplanes and 28 dirigibles.

In 1912 a public subscription in Germany of over 7,000,000 marks gave Germany a formidable fleet of aeroplanes. The Reichstag then voted to provide for the next five years $35,000,000 for military aeronautics.

May we not hope that this transcontinental flight will be our awakening, accomplishing what we so earnestly desire for our advancement in aviation and the air preparedness we absolutely need?

Our co-operation and support can be counted on.

W. D. JUDKINS,
Vice-President, Sloane Mfg. Co.

Glenn L. Martin Co.

I consider the National Aerial Derby a most important development, and believe that it will be a mighty spur which will take American aviation ahead of other countries in rapid strides. It promises to develop aerial preparedness and foster the development of better aeroplanes and motors as nothing else has outside of the present European war.

As a constructor of aeroplanes I look forward to the annual competition that will take place for the Pulitzer trophy as the one national event for which every engineer and manufacturer will make special efforts to produce exceptional aeroplanes built on sound engineering principles for durability and safety of flight.

Making the first competition a transcontinental race was a happy thought. There are aeroplanes and motors made in this country which compare with the best European products. We also have a number of excellent civilian and military aviators. What was needed was some inducement to make all of us show our best. This the transcontinental competition, with $100,000 in prizes, will do, and the annual competitions following this one should keep the standard up to the highest degree.

The Glenn L. Martin Company will do its utmost to make this competition a success and will surely have two entries, which we may increase to three.

In view of the fact that there are some excellent motors made in this country to-day and that the transcontinental competition will afford a supreme test of their general efficiency, I would urge that a special prize be offered for motor efficiency.

Having developed a new motor which, we believe, has exceptional characteristics for durability, I know how much motor makers would appreciate the opportunity of having emphasis placed on the need of motor efficiency.

GLENN L. MARTIN.

L. W. Y. Engineering Co.

As the first entrant in a flight across the Continent in 1911 and the first pilot to start in September of that year, I feel that the projected flight should do a great deal toward awakening the public to a realization of their helplessness against any well planned air invasion.

Also I wish to tender my services, if needed, to map out a course, with which I am familiar, as I am the only living pilot of an aeroplane who has completed this hazardous journey. I might also add in passing that the trip was accomplished with a motor of only 35 horsepower, whereas at present the power for single motor planes now averages close to 135 horsepower.

Do you not think it would be well to make it a condition for the cities which are appointed official controls that the landing field should be used after the flight as a public alighting and starting field for other tourists-of-the-air? This should do much to provide facilities which at present are greatly lacking and which prove a serious hindrance to progress in flying.

If the conditions imposed in the rules governing this flight are not too severe, I will be pleased to enter and feel that there should be at least twenty-five bona fide entries made, if the prizes mount to large figures—as a trip of this kind is exceedingly expensive.

Let us hope that our development of aeronautics will not have to be brought about by necessity of war, but will result from peaceful demonstrations such as outlined by Mr. Pulitzer and the Aero Club of America.

ROBERT G. FOWLER.

Andermat Aeroplane Co.

Mr. Pulitzer's suggestion is on a par with the patriotic spirit of *The World* in its continued effort to make the peace-loving people of the United States realize that some kind hearted, grasping nation will murder the flower of this country's manhood simply because America is not properly organized and has not guns, ammunition, aeroplanes nor ships with which to defend itself.

Rodman Wanamaker's generous offer to finance Curtiss's "America" made possible the huge battle planes that are in use in the European war to-day. Who can tell what a prize of $100,000 will do for future generations? I believe it will place America back in its original position, not only as the inventor of the first heavier-than-air machine to fly, but it seems to me with the concentration of brains of this country on a flight of this kind we can hope to gain our former position in the aviation field of the world.

We have the best aviators in the world; that is conceded by all. What we need is the best engine in the world, and there are any number of patriotic men that could offer a prize *that would set the inventive genius of this country at work to surpass the best engine that Europe has to-day.*

I shall recommend to the directors of the Andermat Aeroplane Company that they build a special plane and use their utmost endeavor to capture the first prize. We will be glad to offer our flying field of 300 acres at Sunnyvale, which is just outside San Francisco, as a proper place to finish the flight. W. G. LOOMIS.

C. & E. Aeroplane Co.

The transcontinental aeroplane competition for the Pulitzer trophy will do more for preparedness and for the advancement of aviation in America than any one thing that could be inaugurated at this time. This competition will teach pilots to fly across country and familiarize them with conditions which will closely approximate conditions during warfare.

The number of entries and interest of the public will surpass your greatest expectations. My company will do everything it can to aid you make this competition a success.

C. & E. AEROPLANE WORKS,
Wm. M. Erb, President

M. F. P. Aeroplane Co.

I consider that the proposed transcontinental flight will be a great inducement to the manufacturers of aeroplanes to produce a reliable machine capable of long sustained flights and will help to do for the American aeroplane what the war has done for the European plane. My company intends to enter the competition and I will certainly give the movement my hearty support. LIEUT. COL. J. B. MILLER,
President, M. F. P. Aeroplane Corporation.

Connecticut Aircraft Co.

We are heartily in favor of the movement. We believe that it will accomplish wonderful results toward preparedness and we will do anything we can to help it along.

CONNECTICUT AIRCRAFT COMPANY.

Christmas Aeroplane Co.

Mr. Pulitzer's idea is big, wholesome and splendid and shows him to be a man of wide vision. The educational advantages and value of the project cannot be overestimated and it comes at a time when our country is confronted with such a grave problem as preparing itself for eventualities which are inevitable.

The competition will give a tremendous impetus to the development of the aeroplane for commercial purposes, a condition which is already looming larger upon the horizon of quick national and international communication. It is my firm conviction that the public has not been intensely interested in aviation because it does not possess sufficient information to make it think.

Any nation which is not adequately prepared in regard to the use of aeroplanes in war is entirely blind and unquestionably at the mercy of any other nation well supplied with aeroplanes. Modern warfare cannot and will not be conducted in the future without a thoroughly efficient aeroplane service on land and sea. This means careful preparation, constant practice service and great concentration of effort, both individually and collectively, and cannot be done in a moment. It takes time; and for that reason the country should be awakened to a situation the gravity of which cannot be exaggerated.

The Christmas Aeroplane Company will be well represented in the contest. DR. WILLIAM W. CHRISTMAS,
President, Christmas Aeroplane Co.

General Aeroplane Co.

We wish to congratulate *The World,* Mr. Pulitzer and the Aero Club of America for the public-spiritedness and patriotism shown in instituting the National Aerial Derby and making the first competition a transcontinental aeroplane race.

We cannot think of anything better than this event to create the public interest in aeronautics which will tend to build our aerial defenses. This event is also to afford a thorough test of American areoplanes and motors, which we believe are as good as the best aeroplanes and motors made in Europe.

The General Aeroplane Company intends to enter at least one of its machines in the transcontinental competition, and hopes to have more. GENERAL AEROPLANE CO.,
A. V. Verville, Superintendent and Designer.
C. Van Husen, Secretary and Treasurer.

THE ATWOOD AERONAUTIC MOTOR

AFTER many months of seclusion our friend Mr. Harry N. Atwood once more appears upon the aeronautic stage and announces the formation of the Atwood Aeronautic Company, Inc., of Williamsport, Pa., and the coming-out of a new 12-cylinder aeronautic motor.

Mr. Atwood announces to us definitely that the above company will receive its Pennsylvania charter on or before May 20th, and that the purpose of the company will be to manufacture motors, aircraft and accessories. In a recent interview with Atwood, when he was in New York, he stated to us:

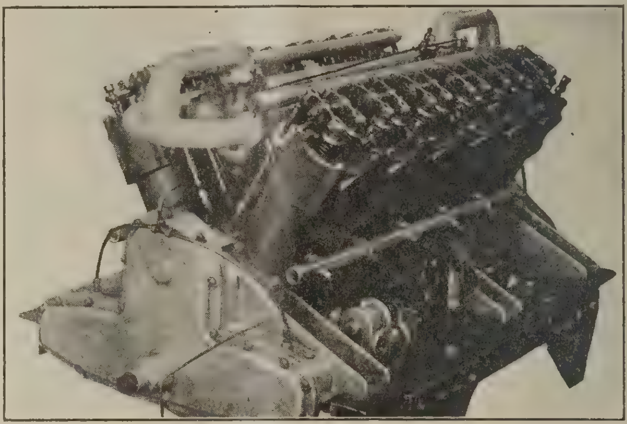
"The Atwood Aeronautic Company, Inc., will be a small, well-organized and well-equipped organization, having a capitalization of $100,000. The corporation is made up of Williamsport men and Williamsport capital exclusively. No promoters have assisted in the organization of the company, and no inducements have been offered to anybody to assist in the financial establishment, except such inducements as the promising industry of aeronautics has to offer. The company intends to manufacture, at the outset, a limited number of motors and aeroplanes, and every piece of apparatus manufactured will be 'tailor-made' from beginning to end. The initial output of the company will not exceed ten motors and five aeroplanes per month, although facilities are provided for a much larger production in event that the demand warrants such an increase.

"Williamsport is peculiarly adapted for an aviation industry. The broad Susquehanna River and the fertile valley through which it flows offers unusual topographic conditions for the testing of both land machines and watercraft, and the company is well provided for efficient work in both of these connections. Not only this, but the city supports mutitudinous and well-equipped plants which can provide at short notice and low prices all of the raw material required for aeronautic production. Perhaps one of the best advantages which Williamsport has to offer is its delightfully mild and healthful climate.

"At the present time the company will manufacture but one type of motor, which will be called the Atwood-12-180. This motor has *not* been designed and constructed according to the unique and biased ideas of any one individual, neither is it an adaption or a revamped design of any standard type of gasoline motor now used for other purposes. It is definitely and specifically an aeronautic motor throughout, and the machinery and facilities which are being installed to produce it are especially and suitably adapted for its particular type. Moreover, there are no new and novel principles introduced into the construction of the apparatus which would make the design in anyway radical or questionable.

"In designing the Atwood-12-180, the first consideration was given to the requirements and conditions imposed upon aeronautic motors, and in this connection I feel that I have had an experience which is representative of the ordinary user of aircraft. In order to meet these conditions the services of the best gas engine experts and mechanical engineers in the country were employed, and no expense was spared in making the engineer's work thorough and complete. Finally, the completed apparatus was put under exhaustive and convincing tests to make sure that it was as nearly perfect as possible before introducing it onto the market. I believe, therefore, that the apparatus manufactured by the company will speak for itself, and will not require the argumentative persuasion of clever salesmen to bring about its commercial sale.

"In regard to the manufacture of aeroplanes, the initial policy of the company will be to construct only upon order and in accordance with the specifications of the individual purchaser. The company will be well supplied with demonstrating and introducing machines, which will be of the latest type. Already three machines are under construction for local sportsmen in Williamsport."

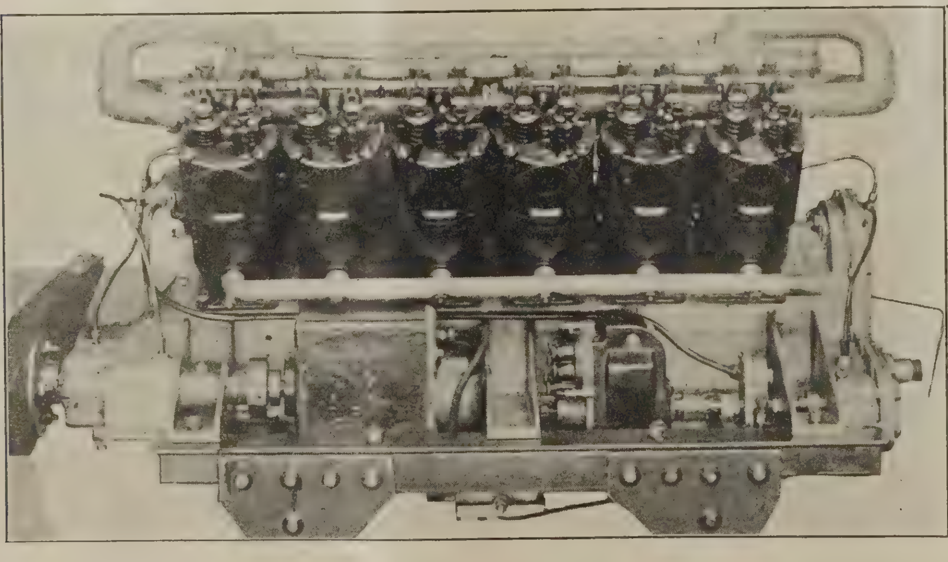


Since the long flight from St. Louis to New York we have heard very little of Mr. Atwood. We knew from time to time that he was engaged in experimentation with new apparatus, but we were not aware of his definite plans. We have been pleased, however, to know that he has always adhered to the safe and sane forms of aviation pursuits, and we believe that his future efforts will continue to be directed along the same lines. We wish him every success in his new venture, and we believe that if he perseveres with the same amount of effort that he did when he made his entrance into aviation that he is bound to succeed.

In announcing the new motor which Mr. Atwood's company is putting out, he requested that we merely quote the specifications, allowing them to speak for themselves. He stated that his company stood ready at any time to prove the reliability of those specifications.

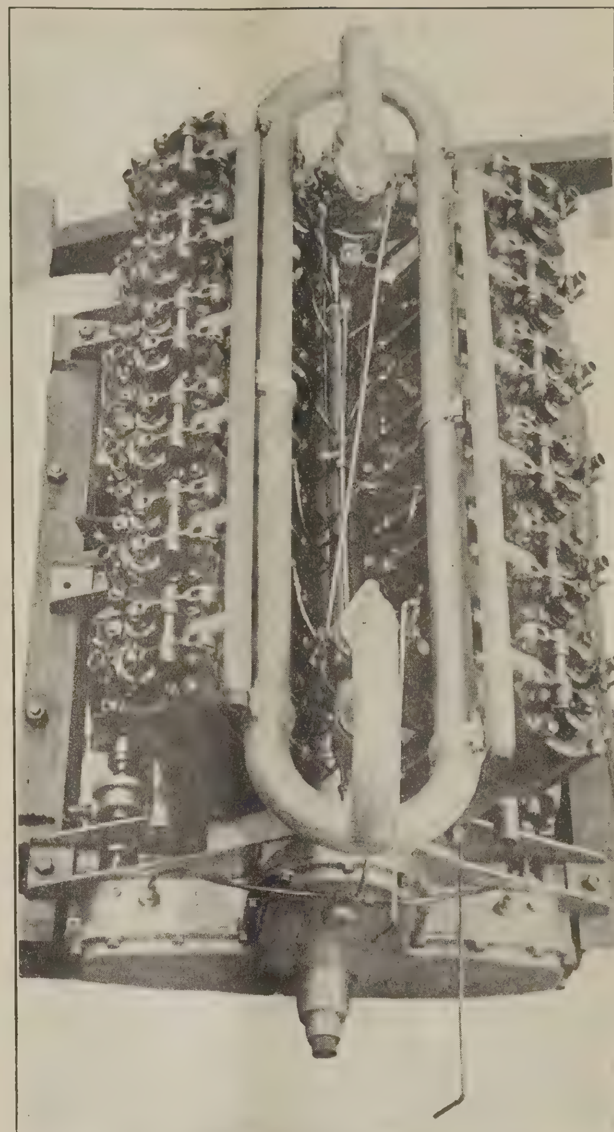
Following are the specifications of the Atwood-12-180:

Type ....12 cylinder, 60 degree V, 4 cycle, water-cooled, valve-in-head, high-speed, automobile type.
Displacement ....732.47 cubic inches, 3.5 inch bore, 4.5 inch stroke, 80 lbs. compression.
Crankshaft speeds......Normal, 2,000 to 2,500 r.p.m. Maximum, 3,200 r.p.m.



Side view of the Atwood Aeronautic engine.

Propeller speeds	One-half the crankshaft speeds, by means of gear reduction in crankcase. Provision made also for connecting propeller direct to crankshaft.
Power delivery	Normal, 120 to 150 h.p. Maximum, 190 h.p.
Total fuel consumption	Approximately .65 lbs. per h.p. hour.
Ignition	Dual ignition throughout, comprising two 12-cylinder magnetos and two sets of spark plugs.
Carburetion	Dual carburetors feeding one specially designed, shore-haul, circular manifold.
Starting apparatus	Special 30 ft. lb. electric motor, capable of turning over the engine at 150 r.p.m.
Water cooling	Forced circulation by means of 90 lb. pressure gear pump.
Oiling system	Combination forced feed by means of 60 lb. pressure gear pump together with splash system, constant level.
Weights	Motor complete with starter and dual ignition apparatus, approximately 650 lbs. Without starter and one magneto, 580 lbs.
Overall dimensions	Approximately 48 inches long. 27 inches high and 26 inches wide.
Crankshaft	Chrome nickel-steel, forged from the slab, ground and heat treated. Seven main-bearing, six-cylinder type.
Camshaft	Chrome nickel-steel, ground and heat-treated, seven-bearing, twenty-four cam type.
Connecting rods	Chrome steel, drop-forged heat-treated, ten-inch length between centers.
Pistons	Special aluminum alloy three-ring type, in accordance with most modern design and practice.
Cylinders	Gray iron, individually cast, ground to size.
Cylinder heads	Gray iron, cast individually, combustion walls machined smooth, water chambers provided around entire intake and exhaust passages, also around valve-seats, valve stems and all combustion walls.
Valves	Tungsten-steel, 1¾-inch diameter, heat-treated. Located in cylinder heads.
Valve mechanism	Nickel-steel forgings, adjustable, all contact points fitted with hardened steel rollers, all bearing points bronze-bushed.
Bearings	Genuine babbitt metal, bronze-backed throughout, also ball-thrust bearings on crankshaft and propeller driveshaft.
Crankcase	Aluminum castings in two pieces. Seven bearing-web type. Provided with separate oil-level chambers and sump chambers.
Intake manifolds	Aluminum, cast in four parts so as to allow inside machining.
Exhaust manifolds	Special combination manifold-muffler provided, if desired.
Carburetor	Special aluminum, aviation type.
Magnetos	Splitdorf, high-tension, nineteen pound, twelve-cylinder type.
Starters	Special, 30 ft. lb. electric type, with 12-80 storage battery.
Ignition wiring	Wiring protected by fibre-tubes, high-tension special.
Oil system	60-lb. bronze-gear pump, forcing oil to aluminum distributor, thence via copper tubes to each and every bearing.
Water system	90-lb. bronze-gear pump forcing water through aluminum manifolds to lower cylinder-jackets thence to topmost point of cylinder heads. Water pockets impossible.



California Naval Militia Active

From the report of the commanding officer of the aeronautic section of the California Naval Militia it seems that the squadron is progressing very well. There are thirty enlisted men in the service and their great interest is shown by the fact that for the past three months the average attendance has been eighty-five per cent. The section has five regular drills a month and in addition they have been having three extra drills of five hours' duration, at which the percentage of men present detailed for the work was one hundred per cent.

The men report every Sunday at seven-thirty and after instruction must remain on the field until the aeroplane is made ready for the next Sunday.

All possible repairs, etc., are made by the enlisted men.

It is intended in the future to give the men instruction in map work and reconnaissance.

Captain J. Hector Worden Killed

Captain J. Hector Worden, the aviator, was killed on May 6 at Dallas, Tex., while attempting to do the underneath loop. It is thought that the immense pressure occasioned by the exposure of the body to the air (in the ordinary loop the body is protected by the machine) caused the aviator to lose consciousness and the control of the machine.

Aviation in the Army Bill

The army bill provides for sixty-five regiments of infantry, twenty-five of cavalry, twenty-one of field artillery, 30,000 men for the Coast Artillery, and seven regiments and two mounted battalions of engineers. In the Aviation Corps the number of officers is increased from 60 to 148, including one Colonel, one Lieutenant Colonel, eight Majors, twenty-four Captains, and 114 First Lieutenants.

The Alaskan Mail Bid

If a satisfactory bond is furnished, Postmaster General Burleson will accept the offer of Earl L. Byers, of Iditarod, Alaska, to establish a twice-a-week aeroplane mail service between Seward and Iditarod. Mr. Byers proposes to furnish aeroplane service twice a week throughout the year, carrying 1,000 pounds of mail on each trip, at a rate of $49,500 a year. The Post Office Department estimates that this would affect a net saving of $34,558 a year, and the mails from the United States to the Nome district would be advanced from twenty to twenty-one days.

With aeroplane service in operation between Seward and Iditarod, this route would be made the trunk line over which mails for points in Alaska north of Iditarod would be served. In winter this would relieve the expensive and roundabout service from Cordova to Fairbanks, to Tanana, to Unalakleet, to Solomon and Nome, of a considerable burden of the mail now carried. The winter mail for the Nome district is carried from Chitina by way of Fairbanks to Tanana by horse-drawn wagon or sled, and from Tanana to Nome by dogsled, a total distance of 1,500 miles. The time of transit of mail in winter from Cordova by Fairbanks to Nome is about thirty-nine days.

"Keeping Up" with the Times

A prominent hotel supply house at St. Joseph, Mo., is apparently keenly alive to the efficacy of up-to-date methods of advertising. Its latest copy, specializing china, glass and silverware, carries the slogan "Aviation Quality" at the top of the advertisement, while appropriately enough at the bottom of the announcement are the words "Submarine Prices."

NOTES ON RADIATORS FOR AEROPLANES

By J. C. Hunsaker.

Theory

In the "Technical Report of the Advisory Committee for Aeronautics," 1912-13, Mr. Lanchester showed that the heat carried away by air passing over a smooth hot surface is proportional to the momentum lost by the air or to the skin frictional resistance of the surface, to the specific heat of air at constant pressure C_p, to the temperature difference between the surface and the air, $t_s - t_a$, and inversely to the velocity V.

Other losses of heat are ignored since in actual radiators for aeroplanes the local convection losses may be neglected on account of the high air speed, and the radiation losses may be neglected because so much of the cooling surface is masked.

Using British Thermal Units for the quantity of heat carried away per second from one square foot of cooling surface, Dr. Stanton gives:

$$q = \frac{C_p}{V} (t_s - t_a) R$$

Here R is the skin fractional resistance in pounds per square foot cooling surface, and may be computed from Zahm's formula for skin friction on even surfaces.

$R = .00000778\ l^{-.07}\ V^{1.86}$, where l is the length of surface parallel to the wind. For ordinary radiators this depth is about 4 inches, and Zahm's formula will reduce to

$R = .0000084\ V^{1.86}$, where V is in feet per second.

For unfavorable conditions, we may take t_s at about 200° F. and t_a (summer temperature) about 80° F. The difference, 120° F. may be regarded as conservative. At high altitudes or in winter the difference is larger and hence cooling more effective.

The most severe condition for motor cooling is climbing at slow speed with full power. For safety, we should proportion the radiator to give adequate cooling under these conditions or for a speed of about 50 miles per hour, 73 feet per second.

The specific heat of air per unit mass under average conditions may be taken as .24 g, then

$q = .0000084\ C_p\ (t_s - t_a)\ V^{.86} = .45$ *B. T. U.*, sq. ft. / sec.

or

$$\frac{.45 \times 780}{550} = .64 \text{ horsepower, per sq. ft. per sec.}$$

An internal combustion motor may be considered to lose nearly as much heat through the water jackets as is converted into useful work, so that, theoretically, we should allow about 1.55 square feet of cooling surface per brake horsepower of motor at 73 feet per second. For lower speeds, more cooling surface would be needed. As a first approximation we may write the following relation, where a is the cooling surface required:

$$a = 1.55 \times B.H.P. \times \frac{73}{V}$$

Comparison with Practice

The above discussion takes no account of the particular style of radiator except to specify that the cooling surface is smooth. No allowance is made for a factor of safety. It is chiefly of interest in showing that, at high speed, we may expect to use less radiator surface in proportion as the speed increases. For a racing aeroplane, which will not climb at full power for any great length of time, we may safely allow one-half the usual radiator surface. Also, if we can put the radiator in the propeller slip stream, it may be made relatively smaller. When climbing, the increased velocity of the propeller race will nearly make up for the slower aeroplane speed.

The Rome Turney Radiator Co. informs me that it is their practice to allow 1.08 square feet of cooling surface per B.H.P. for honeycomb type radiators, and .85 sq. ft. for the helical tube type. These figures apply to radiators fitted on modern military tractors where one would expect considerable help from the slip stream of the propeller.

Prof. Haffner gives in "Handbuch für Flugzeugkonstrukteure" as representing German practice 2.7 sq. ft. per B.H.P. for honeycomb radiators and 2.0 sq. ft. for B.H.P. for aluminum flattened tubes. American motor car practice is about 2.5 to 3.0 sq. ft. per B.H.P. It would appear that unless one wishes to run the motor full power on the ground for long periods of time, Prof Haffner's figures are too conservative.

Considering resistance, although a radiator may be made 25 per cent. smaller when put in the propeller race, but, since the resistance varies very nearly as the square of the speed and only as the first power of the projected area, the total resistance is decreased 25 per cent. and increased 50 per cent., giving a net increase of 25 per cent. The saving in weight will be small, and it appears of doubtful advantage to put the radiator near the propeller.

In practice, radiators are often fitted to the sides of the fuselage. One would naturally expect such radiators to be less effective than in the normal position, due to their greater length in the direction of motion. The allowance of cooling surface should then be somewhat more generous.

The smaller allowance required for the spiral tube type of radiator is not easily explained, unless in the honeycomb type the air may be expected to become somewhat warmed before leaving the cells and the last inch of surface least effective as cooling surface.

Radiator Resistance

The following tests were made in the Wind Tunnel of the Massachusetts Institute of Technology to determine the air resistance of a radiator used for motor cooling in aeronautical work.

The section supplied us by the manufacturer was of the honeycomb type, having sixteen ¼-inch cells to each square inch of surface normal to the wind, the thickness from face to face being four inches in all tests. The first test was made upon a six by six inch section giving a surface normal to the wind of .25 square feet. In the second test this area was reduced to .111 square fet by cutting down the sides from six to four inches. The Drift as measured was corrected for the effect of the supporting rod, determined by a separate test. The results, therefore, apply to the bare radiator. The section was kept normal to the wind and the velocity varied from twelve to thirty-six miles per hour.

The K_x for the section was calculated on the assumption that the resistance varied as the velocity squared and as the first power of the area of the face, S. The following results were obtained:

Velocity feet per sec.	Case I K_x	Case II K_x
52.8	.00079	.00079
44.0	.00083	.00082
36.6	.00082	.00082
29.3	.00082	.00083
17.6	.00080	.00082

Resistance $= K_x S V^2$

Average $K_x = .000814$, pounds per sq. ft. per ft. sec.

The small sections were used in the tests in order to obtain precision in the results. While a large section would more nearly represent actual conditions, the accuracy of the results could be questioned due to the choking of the air in the tunnel in its passage round a large object. The two cases tested represent a difference in area of over one hundred per cent., which should be enough to show any marked variation in the resistance coefficient due to increase in area, or due to the difference in the ratio of thickness area.

The cooling surface of the honeycomb type radiator tested above is about 64 sq. ft. per sq. ft. projected area. The resistance per sq. ft. cooling surface is then $.0000127\ V^2$ as against $.0000084\ V^{1.86}$ by Zahm's formula for skin friction. The greater resistance of the actual radiator appears reasonable in view of the fact that it is not very smooth.

If we used the figure $.0000127\ V^2$ to compute the resistance and the cooling surface by the theoretical method we will have

$$q = .0000127\ C_p\ (t_s - t_a)\ V = .85 \ B.T.U.$$

or

$$\frac{.85 \times 780}{550} = 1.2 \text{ H.P. per sec. per sq. ft.}$$

or .83 sq. ft. cooling surface per B.H.P.

This appears to be very little less than is found necessary in practice.

Radiator Weight

If radiators be proportioned to allow cooling surface in accordance with usual American practice, the weight may be estimated for purposes of preliminary design, as:

Bare Radiator..........	.55 lbs. per B.H.P.
Water in Radiator......	.13 lbs. per B.H.P.
Water in Motor........	.10 lbs. per B.H.P.
Pipes and Leads........	.05 lbs. per B.H.P.
Total	.83 lbs. per B.H.P.

The bulk of the water in the radiator is in the top reservoir, and we may increase the cooling surface materially without great increase in weight of water. Thus, for the honeycomb type, the weight empty of the cells is about .3 lb. per sq. ft. cooling surface. If we allow 1 sq. ft. per B.H.P., the cooling surface proper weighs only .3 lbs. per B.H.P. The radiator including reservoirs may then weigh from .4 to .6 lb. per B.H.P.

The spiral tube type as used in practice will hold more water and be somewhat heavier per sq. ft. cooling surface, but since the cooling surface per B.H.P. is less, we may take the same weight figures per B.H.P.

Huppert gives the figure .7 lb. per B.H.P. for German aluminum tube radiators, allowing 2 sq. ft. per B.H.P. This is the weight of complete radiator empty, including reservoir. If we allow 35 per cent. of the bare weight for water, the radiator filled will weigh about .95 lbs. per B.H.P. Add .15 lbs. for water in motor and for pipes and we have 1.2 lbs. per B.H.P. If the allowance were only 1 sq. ft. per B.H.P., the weight would be somewhat less than that indicated above for American practice.

Cylinder Cooling

The weight of water in the cooling system may be taken as at least ¼ lb. per B.H.P. for modern water-cooled motors. If the radiator be very hot, to afford good air cooling the water must circulate very rapidly in order to carry away sufficient heat from the cylinder walls.

In the notes above, a radiator temperature of 200° F. was assumed. If the water in the cylinder jackets be at 212° F., the drop is only 12°. Taking the specific heat of water as unity and assuming no steam is formed, the following calculation may be made to show the circulation required.

Let P = B.H.P. of motor.

w = lbs. water per second through water pump.

$$\frac{P \times 550}{780} = \text{B.T.U. per second carried by water.}$$

$$= w \times (212 - t_s) = w \times 12$$

or

$$w = \frac{P \times 550}{12 \times 780} = .0587\ P$$

For a 100 H.P. motor, the pump must handle about 6 pounds of water per second, or 45 gallons per minute* This is a velocity of 4.5 feet per second through a 2-inch connecting pipe. If the total mass of water is but 25 lbs., the water in the system makes a complete change in about 4 seconds. Hence, the water in the radiator must have only about 2 seconds to be cooled 12° F. To cool water at such speed, the radiator walls are made thin and of conducting material.

Conductivity of Metal Walls

The conductivity coefficients in small calories per cm. thickness per sq. cm. area per degree centigrade, per second of time are given by the Smithsonian physical tables as follows:

Silver	1.096
Pure Copper	.723
Aluminum	.362
Red Brass	.283
Yellow Brass	.254
Zinc	.265
Nickel	.168
German Silver	.089

To convert the B.T.U. per second per square foot, per inch, per degree F., multiply the above numbers by .804.

Using copper walls of thickness 0.02 inches, we have

$$q = \frac{.72 \times .804}{.02} \times 6 = 174 \text{ B.T.U. per second, per square}$$

foot cooling surface. The air carries away only about one-half a thermal unit per square foot in one second. The conductivity of the metal, therefore, is so great that there is no need to question whether copper, brass, or aluminum is more suitable for radiator construction. In fact, we may call the radiator metal a perfect heat conductor for all practical purposes, and conclude that the heat brought in by the water is carried away by the air as fast as the air can carry it. The effect of the metal walls is to put the air in thermal contact with the hot water while mechanically separating the two fluids.

* B. F. Sturtevant Co. inform me that it is their practice to allow 50 gals. per min. for a 100 B. H. P. motor and 80 gals. per min. for 140 B. H. P.

Steam System

It has been suggested that a modern motor may operate at a somewhat higher temperature (outside the cylinder walls) than 212° F., and that it will be of advantage to evaporate the water into steam in the cylinder jackets and condense it in the radiator. The radiator, if under pressure, can be hotter and hence cool more rapidly.

As a problem, suppose we allow a pressure of one atmosphere, or about 15 lbs. gage per square inch. To convert one pound of water into steam from and at 15 pounds pressure requires 944 B.T.U. and the specific volume of the saturated steam will be 13.74 cubic feet.

One B.H.P. requires .705 B.T.U. per second to be carried off, or an evaporation of only .000747 lbs. of water per second. A 100 H.P. motor then need evaporate but 4.58 pints per minute. The boiling point for this pressure is 250.34° F.

The radiator will be at an average temperature of 250° and if the air is assumed 80° as before, the $t_s - t_a = 170°$ F. For water cooling we allowed a drop of 200 — 80 = 120°. Since the cooling surface required for a given motor at given speed varies inversely as the temperature difference, the steam cooling system may have a radiator about 30 per cent. smaller. If the radiator were made up entirely of cooling surface the resistance would also be 30 per cent. less. Actually the saving in resistance would not be so great.

The volume of water needed to fill the cylinder walls will be about 10 lbs. The ordinary type radiator holds about 15 lbs. of water for a 100 H.P. motor. For steam cooling the radiator will be smaller, but the internal volume will be not greatly different, and will hold about .25 cubic feet of steam. The evaporation is .000747 × 13.74 = .0103 cubic feet per second, requiring a change of its steam content once in 25 seconds.

The circulating pump need handle but 4.5 pints per minute, which is a velocity of 5.3 ft. per sec. through a ½-inch pipe. For the ordinary water cooling system the pump must handle water at nearly the same velocity through a 2-inch pipe.

It is probable that energetic boiling of the water will carry over a good quantity of the water in suspension in the steam, and the full value of the latent heat of vaporization will not be obtained.

To keep the temperature constant, the pressure must not rise above the 15 lbs. allowed. Consequently, a safety valve must be fitted. If the safety valve continuously lifted, the loss of water might, at its maximum, be the total evaporation of 4.5 lbs. per minute. The system containing only 25 lbs., the water jackets would become dry in about 6 minutes. We would, therefore, expect a good reserve supply of water to be carried in a reservoir near the motor inside the body and in series with the circulating system.

From the foregoing discussion, the steam system may be expected to have very little less weight than the water cooling system now in use. The radiator cooling surface may be made some 30 per cent. smaller, and hence of just so much less resistance. However, the total radiator resistance of a modern 100 H.P. aeroplane radiator will be less than 5 per cent. of the total resistance of the complete aeroplane, from which we would conclude that a 30 per cent. saving in radiator resistance is not of interest, if it is made at any sacrifice of reliability of motor.

Resistance to Flow. Radiators are generally built with a top and bottom header connected by tubes or other radiating surface. Hot water is discharged by the pump into the top header from which it ows by gravity through the tubes. If the tubes are small and the pump capacity great, it frequently happens that the radiator will overflow unless a standpipe is fitted.

For example, there has recently been a tendency among constructors to place the radiating surface on each side of the body in the form of very long vertical tubes. An ordinary size tube such as is used in a square radiator on the nose of a tractor is ⅜ inch outside diameter, 22 B and S gage brass, wound with a spiral brass strip of outside diameter ⅞ inch. For a 100 B.H.P. motor about 150 running feet of such tube might be used. The quantity of water will be about 6 lbs. per second. It is apparent that if we use a few very long tubes the resistance to flow may be so great that with the head available the desired quantity of water will not flow through. There should be a limiting length for a given size of tube, which should be greater the larger the tube. An approximate expression for the limiting length of pipe may be deduced in literal form as follows:

Let: P = B.H.P., d = tube diameter in feet, l = length of each pipe in feet, n = number of tubes used, a = feet of tube per B.H.P., b = cubic feet of water circulated per B.H.P. per sec., s = inside cross section of tube in sq. feet.

(*Continued on page* 346)

FOREIGN NEWS

AUSTRIA

The official report for May 16th is as follows:
"Enemy fliers dropped bombs on Kostanyev and on several clearly designated sanitary establishments without causing any damage."

CHINA

The Chinese Government has engaged a French expert to establish a Military Aviation School with twelve aeroplanes of three types.

FRANCE

During the night of May 16-17 French aviators conducted numerous bombardments along the front to the north of Verdun. Fifteen shells of large calibre were thrown down upon an important depot of munitions between Raucourt and Haraucourt, ten kilometers (six miles) south of Sedan; five more on the railroad station at Sedan, where a fire broke out and fifteen on a depot of munitions not far from Azannes. During the same night two French aeroplanes threw down eighty shells on the railroad station at Metz-Sablons.

Aviators of the enemy during the night threw down several bombs in the vicinities of Luneville, Epinal and Belfort. They caused material damage of no great importance.

Corporal Kiffen Rockwell, of Atlanta, Ga., one of the American flying squadron, on May 18th, attacked a German aeroplane operating near Hartsmanweilerkopf. The German machine was brought down in flames.

A German aeroplane of the Taube type appeared suddenly today near Mailly, forty miles south of Arras, and darted toward the edge of the military camp there. A bomb was thrown from the aeroplane, but no material damage was caused.

On May 17th the American aviators who have been in the service of the French army for the last year, and who recently were brought together to form a squadron under the name of the Franco-American Flying Corps, took part in a combined expedition over the German lines for the first time as a unit.

They carried out reconnoitering operations for two hours under a heavy fire and all returned safely. The men participating were:

Sergeant Elliot Cowdin, of New York; Corporal Kiffen Rockwell, of Atlanta, Ga.; Sergeant Norman Prince, of Prides Crossing, Mass.; Sergeant Hall, of Galveston, Texas; Corporal Victor Chapman, Corporal J. M. McConnell, of Carthage, N. C., and Lieutenant William K. Thaw, of Pittsburgh.

Thaw's machine lost part of the tail piece and the propeller was damaged but he returned in safety.

On May 17 unusual aerial activity was reported all along the French front, particularly in the region of Verdun and Metz.

French aviators engaged in thirty-three aerial combats with German fliers today and brought down three of their opponents' machines, the French aeroplanes all returning safely to their bases.

A French squadron again bombarded the railway station of Metz-le-Sablon, just south of Metz. A French flier brought down a German machine with which he became engaged northwest of Rezonville and another German machine was shot down by French aeroplanes in the region of Ban-de-Sapt (Lorraine).

May 16, French bombarding squadrons dropped bombs on camps and railway stations in the region north-northwest and west of Verdun. The points bombarded included camps in the region of Damvillers, Chaumont, Nantillois, and Romagne; the railway stations at Brieulles, Clery, Apremont, Grand Pre, Ars, Metz, Arnaville and between Metz and Thionville, and the hangars at Frescati. A German machine was brought down by one of the French fliers at Ci-sur-Aisne.

Georges Bouillot, the famous automobile racer and aeroplane pilot, has been killed in a fight with five German aeroplanes. He succeeded in bringing down one of the enemy machines before he was shot through the heart by a bullet. M. Bouillot earlier in the war was chauffeur for General Joffre. He won the Grand Prix of the Automobile Club of France in 1912 and 1913.

Corporal Victor Chapman, of New York, has been proposed for promotion to the rank of sergeant for his pursuit of a German machine that flew over the aviation camp seeking revenge for Corporal Rockwell's exploit.

Lieutenant William K. Thaw, of Pittsburgh, has been proposed for citation for pursuing a second German machine from the camp, continuing the flight at close range until his machine gun jammed. Lieutenant Thaw also is credited with forcing down another German machine, probably to destruction, but it has been impossible to verify this officially.

GERMANY

The official German report for May 20 is as follows:
"Near Ostend a hostile aeroplane was brought down by the fire of our anti-aircraft guns, and fell into the sea. Four other machines were shot down in aerial encounters. Two of them fell within our lines, one near Lorgies, north of La Bassee, and the other near Chateau Salins. The remaining two fell within the enemy's lines, one in Borrus Wood, west of the Meuse, and the other beyond a hill east of Verdun."

Although the British claim that there were no decisive results to a naval combat fought off the Belgian coast on May 16th German authorities claim that a British cruiser was hit by a bomb from a German aeroplane. The German report follows:

"Some British warships appeared off the coast of Flanders. German warships, accompanied by patrol boats, went to meet them. A short fight ensued at long range, during which a German aeroplane dropped bombs on an enemy cruiser, which was observed to be hit near the conning tower."

GREAT BRITAIN

Lieutenants Selwyn and Bateman, military aviators, were killed instantly on May 18th, at Gosport, in Hampshire near Portsmouth. The aeroplane in which they were flying fell from a height of 1,000 feet. The cause of the accident has not been determined. Both the lieutenants were experienced.

Lord Beresford, who recently made strong allegations in the House of Lords against the efficiency of the British air service, appeared on May 17th before a committee appointed to inquire into charges made by himself and others and retracted his statements.

He declared that at the time he made these assertions he considered them accurate, but on further investigation he found they were incorrect.

El Arish was bombarded on May 18th by British warships and aeroplanes and the fort is reported to be destroyed. The official report follows:

"The general officer commanding in chief in Egypt reports that our ships, aeroplanes and seaplanes successfully bombarded El Arish, an important post on the enemy line of communications from Syria to Egypt, on the morning of May 18. The ships bombarded the fort southwest of the town, and are believed to have reduced it to ruins.

"The aerial attack was divided into two phases. The seaplanes opened the bombardment, being followed later by the aeroplanes. The latter were given ordrs to engage any hostile machines and to devote special attention to the enemy troops and camp. A column of troops, about 1,000 strong, was seen south of the town on the march, and three bombs exploded among them. All the camps were effectively bombarded."

El Arish is a fortified town of Egypt on the Mediterranean.

On May 17th Mr. Harold J. Tennant, Under Secretary of War, announced in the House of Commons that the new Air Board will consist of Lord Curzon, Lord Sydenham, Major Baird and two military and two naval representatives, with Lord Curzon as president.

It will be an advisory body and will be free to refer unadopted recommendations to the war committee.

William Johnson-Hicks, Unionist member for Brentford, in moving a resolution that the Government should not delay making adequate provision for a powerful air service, advocated bringing the existing air services together under a responsible minister.

Winston Spencer Churchill, former First Lord of the Admiralty, said that he was disappointed at the Government's proposals, which seemed to him to be an attempt to parry the request for an air ministry.

"The faults of our air service," he said, "are due to the duality of control and the lack of a paramount authority. We have lost the supremacy of the air for the time being, but only the Government has prevented its recovery."

Mr. Tennant, Andrew Bonar Law and Lord Hugh Cecil contradicted Col. Churchill's statement that the supremacy of the air had been lost. Great Britain, they said, possessed two types of machines faster than the German's best and defenses against Zeppelins had been perfected.

Three enemy aeroplanes destroyed, a fourth captured and one British machine lost is the summary of over-earth activity as given in the official report issued May 21.

"Yesterday," says the report, "our aeroplanes had several successful encounters. An aviator fell, on fire, into some trees near Abimfor Wood in the enemy's lines, one of its occupants being seen to fall out. Another hostile machine fell, in flames, near Contalmaison, also in the enemy's lines, after an encounter with one of our scouts.

"A third crashed to earth in our lines near Mariscourt. One of our aeroplanes fell in the enemy's lines. Early this mornnig a hostile machine landed undamaged in our lines. The pilot and observer were made prisoners."

Two soldiers and four civilians and a child were killed, and 35 other persons were wounded as a result of two German aerial raids on the city of Dunkirk on May 20th. Two of the raiding aeroplanes were brought down by aviators of the Allies. Altogether there were 120 bombs dropped by the raiders. As a reprisal for the raids, 53 machines of the Allies dropped 250 shells on the German cantonments at Wywege and Ghistelles. The official report follows:

"German aeroplanes carried out since yesterday two bombardments in the region of Dunkirk. About twenty shells were dropped last evening, killing four persons and wounding fifteen. On May 20 another enemy squadron dropped about a hundred bombs in the outskirts of Dunkirk. Two soldiers and a child were killed, and twenty persons were wounded.

"Allied aeroplanes pursued the enemy machines and succeeded in bringing down two at the moment they were about to enter their own lines.

"Immediately after the first bombardment fifty-three French, British and Belgian aeroplanes flew over the German cantonments at Wywege and Ghistelles, on which 250 shells were dropped.

"German aeroplanes on May 20th dropped fifteen bombs on Belfort, but the material damage was insignificant."

ITALY

Italian headquarters at Udine reports that Austrian aeroplanes are displaying great activity and have made several attacks on towns in the vicinity of Venice. It is stated that these attacks have caused insignificant material damage, that no lives have been lost and no military results accomplished.

Austrian headquarters reports these activities as follows:
"Strong squadrons of military and naval aeroplanes yesterday and the night before dropped many bombs on railroad stations and other establishments of Venice, Mestre, Cormons, Cividale, Udine, Perlacardin and Erwiso. Good effects were observed at all these places, particularly at Udine, where about thirty anti-aircraft cannon maintained a useless fire."

Austrian naval headquarters reports that an Austrian naval aeroplane squadron successfully bombarded military establishments at Avlona (Albania) and Satino during the afternoon of May 13. The aeroplanes, it is added, returned undamaged, in spite of being heavily shelled.

The Italian war office on May 17th issued the following statement:

"One of our hydroaeroplanes bombarded an aeroplane shed near Trieste, setting it on fire. Enemy aeroplanes dropped bombs on Castel Tesino, Ospedaleppo, Monte Belluna, the station Della Carnia and Gemona. There were some casualties, but no material damage. One of our air squadrons threw bombs on Drillach and Kotschach, in the Gail Valley, causing fire."

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

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Tractors vs. Pushers

The question of why more power is required to drive a single tractor (propeller in front) model than a similar one in which the propeller is placed in the rear of the machine is one that has been answered quite satisfactorily by Mr. V. E. Johnson, M.A., model editor of *Flight.*

This question *re* the position of the propeller or propellers, states Mr. Johnson, is one of the greatest importance, and a few remarks *re* the respective advantages and disadvantages of either system will no doubt be of interest.

So far as full-sized monoplanes are concerned, structural difficulties render it easier (apart from other reasons) to arrange the propeller in front than behind. One of the first things discovered was that the machine lifted more. Quite simple experiments only are necessary to show that when a propeller revolves, air is drawn in from the front and all round from the sides and driven off to the rear in approximately a cylindrical column.

The lift per unit wing area will, therefore, be increased for the following reason, viz, because the speed of the wings relatively to the air is increased.

If V be the velocity of the machine and v the velocity of the column of air driven off by the tractor, then, remembering that the lift of a wing or plane is proportional to the *square* of the velocity, we have: $\dfrac{\text{Lift in case of propeller type}}{\text{Lift in case of tractor type}} = \dfrac{V^2}{(V + v)^2}$. The result is, however, also much affected by the *diameter* of the propeller, because it is of primary importance to engage as much air as possible. It is more efficient to engage a large amount of air and impart to it a small velocity than to engage a small amount and give it a great velocity. Owing to the sucking-in action of the propeller, to which we have referred, more air is engaged, this also increasing the lift.

Now flying, as all students of aerodynamics are aware, is a phenomenon that is concerned with motion relative to the atmosphere, and not at all, directly, with motion relative to the earth. Our correspondent, who asks why more *power* is required to drive a tractor model, is evidently looking at flight from the earth-bound man's standpoint—that is to say, he does not allow for the excellent progress that the model may be making through the draught of its own screw.

Imagine for a moment that the wings and the screw were independent of each other. It is then readily possible to imagine the wings being supported by the slip-stream of the propeller, as is a kite in the wind. One says, quite properly, a kite flies in the wind, but having regard to the fact that it also stands still over the earth, it would, from our correspondent's standpoint, be singularly wasteful of power were a tractor screw employed, as it might be, to supply the pull that is ordinarily derived from the kite flyer's muscles.

The mental comparison of kites and aeroplanes, and also helicopters and aeroplanes from the power standpoint, is most instructive, and helps perhaps more than any other line of thought to fix ideas on the true inwardness of the phenomenon of flight, and particularly on that aspect of it which has to do with the purely incidental character of any motion relatively to the earth's surface that may take place in consequence of the flying.

A point of some practical consequence is the influence of propeller position on longitudinal stability which is referred to by Mr. A. E. Berriman in his "Principles of Flight," pp. 39 and 40. One or two of the chief points are the following: Presuming the propeller right in front (tractor), then since its draught affects both the main planes and the tail, the stopping of the engine in flight should not seriously affect the balance. In model practice this is borne out by the fact that a properly designed tractor can and does very often glide to earth when the rubber motor is run down. If the propeller is in the rear, or the tail lies entirely outside its influence, then there is no effect. The propeller can, of course, lie between the main plane and the tail, and often does so in the case of a full-sized machine. In the case of rubber-driven models this is very seldom the case, owing to its shortening effect on the motor rod, and the consequent fall in duration or distance; in the case of a power-driven model this difficulty does not arise. In this case, as Mr. Berriman points out, the stoppage of the motor in mid air will at once deprive the tail plane of some of its lifting power, and it will in consequence tend to droop, thus disturbing the equilibrium of the machine; presuming, however, the machine tilted up in mid air (owing to some other cause), then the use of the propeller draught acting on the elevator flap of the tail might be of the greatest service in restoring equilibrium, owing to its lifting effect on the flap. This presumes, of course, the possibility of accelerating the motor at will.

The Texas Model Aero Club

The Texas Model Aero Club held its May trials on May 14th. The usual flying grounds were occupied by the National Guard, thus causing the fliers quite a hike to get clear of the camp. The flying was somewhat of a novelty to the "rookies" whose interest was of the right sort although the models required careful guarding from getting under their feet.

The feature of the day was the model of unique plane design flown by Carl Gildemeister. The planes are extremely swept back with still further swept back tips which are very flexible. In operation the model is a marvel of speed despite the fact that the main plane has a spread of 41 inches and a chord of 6 inches. This model was easily the favorite with the "rookies," being nicknamed the "crooked devil." It is also a good model for duration, making 87 seconds on rubbers wound a little over half their winding capacity and being fitted with propellers whose weight is almost prohibitive as they are carved from pitch pine.

The best record of the day was 120 seconds by Hamer Smith. The rubbers on all flights were not wound over two-thirds their capacity and were unlubricated as the flights were only trials.

The final Villard flights will take place on Sunday, the 21st, and much is expected as the models are keyed to their higher pitches.—*Homer Smith,* 711 Erie Ave., San Antonio.

Illinois Model Aero Club

At the Friday night meeting of the club, May 20th, Mr. Baker told the club of a plan to organize a national aero reserve in this state, stating that the members of the Illinois Model Aero Club would in all probability have the first chance to join such a reserve. His talk was very interesting. Mr. Baker's address was followed by one from Mr. Hiegh, of the Chautauqua circuit, and editor of a Chautauqua magazine.

One of the most important events undertaken by the club was organized last meeting. The members who had never previously won a prize were divided into two teams, captained by Mr. Carleton and Mr. Bergman. The contest will be held for distance very soon.

Mr. Nealy and Mr. Weaver of the club last week gave a model exhibition before the Navy League at its last banquet.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Attorney Lacked Appeal

A pilot arrested for a penal offense was assigned a lawyer whose crude appearance caused the unfortunate prisoner to ask the Judge:

"Your Honor, is this my lawyer?"

"Yes."

"Is he going to defend me?"

"Yes."

"If he should die, would I have another!"

"Yes."

"Can I see him alone in the back room for a few minutes?"

A near-sighted old man was once watching some experts ski running and jumping, when all of a sudden one of them made a tremendous flying jump of many yards over a high bank and landed safely on his feet. "Well, by Jiminey, I never thought that fellow was an aviator with those planes on his feet."

An elderly lady of a very inquisitive turn of mind, just one of those kind you know that is forever butting into other people's affairs, was walking around looking over the latest airship for the carrying of passengers when she poked her head into the cook's galley and very pertinaciously inquired: "My dear man, when you are flying through the air and you happen to run short of milk on board, what do you do, as I have not seen any cows aboard." "Why, ma'm," replied the son of Gaul. "why, mam, we just up and tap the MILKY WAY."

EXPENSIVE.

Mr. Bunk (reading bill for airship repairs)—"The high cost of living is bad enough, but it can't touch the cost of high living."

Two aviators were once talking around the campfire outside of the hangar during the late evening at the fall manoeuvres last year, when one says: "Say, Bill, talking about women and their peculiar ways, do you know what is the most scandalous corporation on this earth?" "Why, no," says Bill, "I don't, Jim, what is the most scandalous corporation on this old earth." "Why, Bill, the great 'B' Telephone Corporation." "How so, Jim, I don't understand why the great 'B' Telephone Corporation should be the most scandalous corporation on earth." "Why, Bill, old top, don't you see that they carry more tales than any other corporation on this earth?"

While a parson was preaching the funeral oration over the casket in a country church one fine summer's day, two weary travellers were passing by and, of course, wandered in to get a cheap rest, when they heard the parson discoursing upon the past virtues of the dead one and, of course, not knowing who it was that was dead, sat in attentive form listening to the following: "My dear, beloved, departed brother was a most lovable charming character, one who endeared himself to all who met him. His aspirations were so lofty that my dear brethren and sisters, they often took the departed to the highest realms of, etc., etc." "Say, Dick," says one tramp to the other, "this poor devil must have been an aviator."

The other day several children were being taught how to sing some hymns in a country Sunday school, when they came to that good old hymn which runs: "Ring the bells of heaven, there is joy today," etc., etc., when one little urchin whispered to his side partner: "Say here, Jimmy, that fellow who could ring the bells of heaven must have been one of those here fellows that fly in them aerothings."

Jones was coming home one morning very, very late from a tea-fight like all good fellows do, you know, when his dear, devoted wife was actually laying for him, with a good hard-headed hickory limb, when in poor Jonesey tumbled, coatless, hatless, shoeless, pantless and shirtless, all dirty and forlorn looking, when old mother Jonesey, startled at his terrible appearance, did not gently chastise him, but asked in terror: "Why, John, where have you been?" "My dear (hic) I hash been up in a Zipperlin, my deash, and they bombarded me with shells, my deash, with shells, my deash (hic) until I fell out and landed right here at my doorsh.

Sitting one winter's night around the fireside telling stories and asking riddles were a happy lot of folk, when one says: "Say, folks, what is the difference between an airship's strut and the sky." "Why, we don't know; give it up," chorused the rest. "Do please tell us." "Why, its plane, of course, don't you see."

Some Germans were sailing around in their Fokker one night, when one of their number started to talk rather loudly having taken too much out of his stein, when the pilot cautioned him to keep quiet. When the hilarious one said: "Why shouldst I keepsh quiet, I likesh to know?" "Why," says the pilot, "don't you know that even the aeroplanes carry tails (tales).

A would-be know-it-all was once discoursing very grandiloquently about aeronautical matters in general when a certain wise one asked him what a stabilizer was. This stumped him when he suddenly exclaimed it's to keep a drunken aeroplane right.

(*Continued from page* 332)

These representatives will be present in the capacity of inspectors, and will observe the following points, and such others as they may deem advisable:

That the constructors provide the proper strength of construction and the proper quality of material and grade of workmanship for each machine; that they make satisfactory provisions against deterioration of structural and other parts due to wear, vibration and the action of salt water and moist air, varying climatic conditions, etc.

To determine that the constructors have an efficient system of expert inspection to insure the above qualities.

That all details of construction conform to the best proved and approved practice.

To require such tests of material or of assembled or component parts as is deemed necessary, and observe such tests.

To reject any unsatisfactory part at any time during the construction of any machine at the factory.

To require supplementary tests as desired of materials and parts when deemed advisable.

To see that steel used in construction will be of such a grade as to have high resistance to crystallization due to vibration.

The use of such other materials as have not been proved by test or experience to be non-subject to crystallization due to vibration will be discouraged.

To see that provisions for the protection of metal parts, and adjoining wooden parts, against the corroding action of salt water and moist air, are satisfactory.

If laminated wood parts be used, to see that provisions for protecting them against the action of salt water, vibration, etc., are satisfactory. Particular care shall have been exercised to prevent access of moisture at faying surfaces, to end grain butts, scarfs and joints, and such protection must be applied before the final assembly of parts.

To see that the threads of all bolts and nuts used in the construction conform to the U. S. standard, except where castle nuts are used, when the threads shall be of the S. A. E. Standard. Pipe threads will conform to the Briggs standard.

Interchangeability of parts, assembled and component, fittings, etc., will be considered desirable, but this attribute should not interfere with others.

The main landing wheels will be of sturdy construction, have tangential spokes, and be not less than 24 inches in diameter, or less than 4 inches in tire width.

The wheel tread should be between 0.13 and 0.19 of the spread of the lower wing.

The wing covering to be of the best grade of raw linen, of weight not less than 3.75 ounces per square yard. The method of covering the wing to be such as to render the cloth of the proper tautness, smoothness and security. Holes about 3/16 of an inch in diameter with rust-proof eyelets shall be placed between each rib, near the inner rib in each case, on the lower surface of the wing, about 1.5 inches from the trailing edge.

The color scheme will be as nearly white as practicable, using standard dopes and varnished.

Stranded steel cable will be used for all tension members which are readily accessible for adjustment, and for all control leads.

All cables which are members of the wing structure and normally under tensile load in flight will be in duplicate, and made independent between fittings.

All control cables will be in duplicate, each wire being independent of all others, and isolated from all others as much as is practicable, between control columns and surface yokes.

Satisfactory provisions will be made, as far as it is practicable, for convenient and thorough inspection of control cables and pulleys and vital structural members. The material and method of tipping propellers will be such as to insure protection against the action of sand, as well as to render the tips secure in place.

All gasoline tubing to be satisfactory as to flexibility, durability, impenetrability and to have been tested for leaks after vibration.

Gasoline leads to reserve tanks, the control leads, and the carburetor adjusting rod shall be provided with suitable, safe and readily accessible couplings.

The gasoline tanks, oil and water reserves shall be of sufficient capacity to permit of a flight of at least six hours' duration in hot weather with motor turning at the number of revolutions per minute required for its full rated power.

It will be considered desirable to have provision in the gasoline tank system for reducing to a minimum loss of gasoline due to bullet holes.

Fuel tanks which may in service be subjected to internal pressure will be of sufficient strength to withstand an internal pressure of at least six pounds per square inch. Wherever necessary, fuel tanks will be divided by the proper number of swash plate bulkheads.

The radiator will be of approved design and so constructed as to be proof against the action of vibration.

The inspector will be prepared to submit, ten days before the contract date of delivery of the first machine of the group ordered, a proper, complete, itemized list of the spare parts required for the equipment ordered, and the nature of service designated. The list will include itemized cost.

At the request of one of the inspectors, the contractor shall furnish the inspector the following:

Data which will show the capacity of the factory and affiliated factories, and the standing and responsibility of the firm.

Drawings pertaining to the construction of the aeroplanes being supplied.

Authenticated data from wind tunnel tests on an exact model of one of these machines, made to a suitable scale, as follows: Pitching moments (force vectors being plotted), at angles of incidents (mean chord, main planes) from minus 9 degrees to plus 24 degrees, observations taken every three degrees, and in addition at the following angles: Minus 2 degrees, minus 1 degree, plus 1 degree, and plus 2 degrees. The model shall have movable elevator surfaces cut off for the tests.

Data showing the elastic limit, hardness and other important physical characteristics from authenticated records of tests on the exact steels (exact including final heat treatment, if any) used in the construction of the various parts.

Reliable historical information regarding the origin and time and method of seasoning of the material for wooden parts.

Records of tests of glue, cement, shellac, varnish, or dope when required; such tests should comprise alternately soaking in salt water and drying, etc.

Three complete sets of factory working drawings of the complete aeroplanes, for transmittal as desired by the Chief Signal Officer of the Army.

(*Continued on page* 346)

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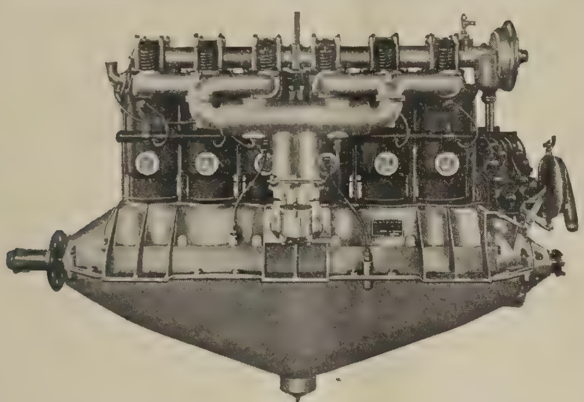
Aero Engines "THE BIG SIX"



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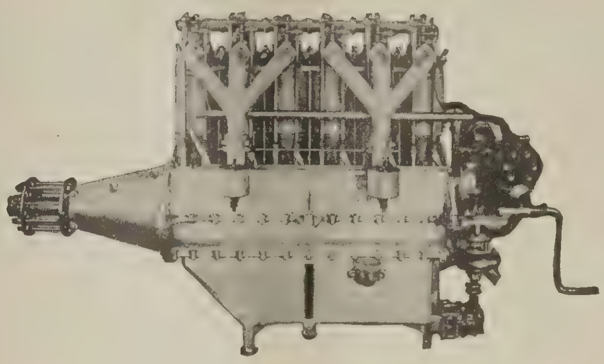

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(Established 1790)
Universal Life Saving Equipment Dept.
NEWARK, N. J.
"WE PAY THE EXPRESS"

(*Continued from page* 344)

All data, drawings and information furnished by a contractor to an inspector is to be treated as strictly confidential and shall be imparted only to officials of the War Department.

In the event of a decided disagreement between inspector and manufacturer on a point which involves considerable expense on the part of the manufacturer in order to effect the change required by the inspector's suggestion, the matter will be referred to the Chief Signal Officer of the Army for decision.

Inspectors and their assistants will be given free access at all times during the manufacture of aeroplanes, or parts thereof, being constructed in accordance with this specification, to any and all parts of the factory in which a part of the aeroplane is handled.

Acceptance of an order under this specification shall signify that the contractor agrees to all of the provisions of this specification, and that the true intent and purpose of these provisions will be adhered to.

OFFICE OF THE CHIEF SIGNAL OFFICER OF THE ARMY.

April 24th, 1916.

An Aerial Ambulance

An Aerial Ambulance, it is reported, is being built by a California manufacturer, and army aviators at San Diego, Cal., have been permitted to see it. Under the body of the aeroplane is slung a small cot, which is so fastened and constructed that it will be impossible for the occupant to fall out or even be shaken when the aeroplane volplanes to earth. It is understood that while the craft is en route to the hospital a trained attendant will be enabled to give first aid to the patient.

New York Flyer Killed in Action

Mr. R. A. Horton, of Oyster Bay, announced on April 21 that he had received a letter announcing that Lieutenant W. E. Hedger, of New York City, an aviator with the British army, had been killed in action. The letter, he said, was signed by Mr. Robert Black, flight commander, and was addressed to Mr. Horton as a friend of Lieutenant Hedger. Mr. Horton said that Lieutenant Hedger returned to New York City last January and was here for seven days. He entered the British service at the outbreak of the war.

(*Continued from page* 339)

Then: $n = \dfrac{a\,P}{l}$

velocity in each tube $U = \dfrac{b\,P}{n\,s} = \dfrac{b\,l}{a\,s}$

$$s = \frac{\pi\,d^2}{4}$$

Total head is the sum of velocity head at exit $V^2/2g$, head lost at entrance $1.5\ V^2/2g$ and head lost in friction $(f\ l/d)$ $(V^2/2g)$, where f is the coefficient of friction for the tube. The coefficient f for clean tubes and water moving at velocities from 4 to 8 feet per second is about 0.04 for $d = 0.025$ ft., and 0.03 for $d = 0.05$ ft. For radiator work a rough value $f = 0.035$ is sufficiently exact. The total head is expressed as the sum

$$h = h_1 + h_2 + h_3 = (1 + 1.5 + f\frac{l}{d})\frac{V^2}{2g}$$

$$= (1 + 1.5 + f\ l/d)\frac{b^2l^2}{2ga^2s^2}$$

The limiting length is $l = h$. If $l > h$, an additional head given by upper reservoir height or stand pipe is necessary, or the radiator will overflow. Equating h to l, we may solve for l and obtain:

$$l = \left(-2.5 + \sqrt{(2.5)^2 + \frac{8\ fga^2s^2}{db^2}}\right)\frac{d}{2f}$$

If $a = 1.5$ ft., $b = .001$ cu. ft., $d = .027$ ft., $f = 0.035$, we find $l = 5.8$ feet, as the limiting length of ⅜ tubing.

Consequently, if radiator weight is to be saved by use of very fine tubes, the height must be small. Long tube side radiators, which are often six feet in length, must be made of at least ½-inch tubing. They will hold a larger volume of water and hence make a heavier radiator.

The feet of tube per B.H.P. may be about halved if the tube diameter and cooling surface per foot are doubled. We have then half as many tubes of given length and since s is increased 4 fold, the velocity of water in each tube is halved. The loss of head in the tubes is then only one-quarter as much as before and there should be no trouble from overflow.

The doubling of tube diameter may halve the total length of tubing needed, giving the same tube weight as before, but the water filling the tubes will weigh twice as much as before. The lighter radiator will, therefore, be made of short lengths of fine tubing.

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Army Appropriation Bill Does Not Meet Aeronautical Needs

FINDING that the Army Appropriation Bill adopted by the House Military Affairs Committee, and which is expected to come up before the House to-morrow, does not even provide to put into effect one-third of the small Army aeronautical program, the Executive Committee of the Aero Club of America held a special meeting late Saturday night and drew up the following protest, which has been sent by special delivery to President Wilson, Secretary of War Baker, Congressman James Hay, Chairman of the Military Affairs Committee; J. J. Fitzgerald, Chairman Appropriations Committee; Julius Kahn, ranking Republican member of the Military Affairs ommittee; House Leader Claude Kitchin, Congressman Chas. Lieb, Senator Benjamin R. Tillman, Chairman Naval Affairs Committee; Hon. Geo. E. Chamberlain Chairman Military Affairs Committee; Hon. Joe C. Robinson, who investigated the trouble in the Army Aviation Corps; Hon. James O'Gorman, and Hon. James W. Wadsworth, Senators from New York. The protest addressed to President Wilson follows:

"HON. WOODROW WILSON,
President of the United States,
Washington, D. C.

Dear Mr. President:

The Army Appropriation Bill adopted by the Military Affairs Committee of the House, and submitted for passage by that Committee, does not provide to carry out more than one-third of the provisions of the Chamberlain-Hay Army Reorganization Bill, which provides for the organization of eight aero squadrons, and, whereas, it would be fatal to again disregard the aeronautical needs of the Army, we beg to bring the following facts to your attention:

(1) The $1,000,000 which the Army Appropriation Bill gives to pay for the organization, equipment and maintenance of the air service is not even sufficient to provide the number of aeroplanes which General Funston should have to-day at the Mexican border to protect American lives and American property from the attacks of Mexican bandits.

(2) The Army, having charge of coast defense, which in other countries is in charge of the Navy, needs aeroplanes, dirigibles, observation balloons and kites, for the protection of our coast. These are not provided for in the Army Appropriation Bill.

(3) It is estimated that the aviation equipment alone should consist of not less than twenty-four complete aero squadrons, each squadron being allowed three aeroplanes for each aviator, or twenty-four aeroplanes to each squadron.

(4) Years of experience have shown to the War Department that it costs $256,000 to organize, equip and support for a year an aero squadron of only twelve aeroplanes. It having been found that it is absolutely necessary to allow three aeroplanes to each aviator, the cost of organizing, equipping and maintaining an aero squadron is increased to approximately $400,000.

(5) The Mexican trouble has proved beyond dispute that the $300,000 allowed for Army aeronautics last year was not sufficient to equip and maintain a single complete aero squadron. Therefore, the $1,000,000 provided for in the Army Appropriation Bill would only be sufficient for two and one-half aero squadrons.

(6) If the Chamberlain-Hay Reorganization Bill is to be put into effect and only eight aero squadrons are to be organized, then the appropriation for Army aeronautics should be $3,200,000, the amount needed to organize, equip and maintain the eight squadrons. To this there should be added at least $2,000,000 to provide for the acquistion and operation of dirigibles, observation balloons and kites.

(7) Other countries having gained such a lead that the United States Army now ranks about twenty-third in aeronautics, behind all the European powers and their colonies. The appropriation of $5,000,000 for aeronautics would only enable this country to become eighth in rank, behind England, Germany, France, Russia, Italy, Austria, and Turkey. There are a dozen European aviators who have each brought down between ten and twenty aeroplanes in air duels. The United States Army has not to-day as many aeroplanes in commission as have been destroyed by one of these aviators; the Army Appropriation Bill provides for less aeroplanes than have been destroyed by three of these aviators. We submit, therefore, that an appropriation for Army aeronautics of $5,000,000 is required for national safety.

(8) The Chamberlain-Hay Bill provides for the Federalization of the Militia. The Army Appropriation Bill does not provide for supplying the Militia with the equipment necessary. The National Guards of forty States are anxious to organize aviation detachments, and have applied to the War Department for aeroplanes and equipment, which have been denied to them, the War Department replying each time that it has no funds available for this purpose. The Aero Club of America and its thirty affiliated aero clubs, and other organizations co-operating with them, have succeeded in supplying aeroplanes, and training aviators, to enable thirty-five States to take steps to organize aviation detachments.

If we are to rely mainly on the National Guard for the defense of this country, the National Guard must not be denied the aeronautical equipment which it rightly seeks, and which is absolutely necessary for military efficiency. Whereas, the Committee on Military Affairs has not seen fit to include in the Army Reorganization Bill a provision for the 24 aero squadrons which are absolutely necessary for the defense of this country, provision should be made to supply the National Guard of the forty States with sufficient aeroplanes and equipment to form substantial aviation detachments, composed of four aeroplanes and the necessary spare motors and spare parts. This equipment and the operating cost would amount to about $100,000 for each aviation detachment, making $4,000,000 for the forty States that are now ready to organize aviation detachments.

(9) Congress provided in 1914 that sixty officers should constitute the Aviation Corps of the United States Army. But when these aviators were needed this year to protect American lives and American property from the raids of Mexican bandits, the Army could furnish only one-fourth that number of trained aviators and scant equipment for only a fraction of that number. While the main cause of this deficiency was that Congress never provided the funds for carrying out this provision of the law, it is a fact that the Army could not easily supply all the personnel necessary to organize the eight aero corps provided for in the Chamberlain-Hay Bill. It is proposed, therefore, that ten Army (and ten Navy)

America Must be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

aviation schools be established to train 2,000 Militiamen, Coast Guardsmen and mail carriers, to be recruited from every State in the Union in proportion to the population of each State. A portion of these men will eventually enlist in the Army and Navy; others will form the personnel of aviation detachments in the Militia. The rest will form a reserve. This plan has been unanimously endorsed, and should be put into effect, which can be done at the cost of only $2,000,000.

(10) Earl Kitchener a few days ago stated that an aviator is worth an Army Corps. The Army authorities all over the world agree that aeronautics affords possibilities for quick development and immediate relief at only a fraction of the cost of developing other arms. The foregoing figures show that the United States could be supplied with an efficient system of aerial defense for less than the cost of one of the dreadnoughts provided for under the Naval Appropriation Bill.

(11) Recent demonstrations have shown that American aeroplanes and American motors are equal to the best European products. In certain types American aeroplanes are superior to anything manufactured in Europe. The announcement of the Transcontinental Aeroplane Competition, which is to start on September 2, and for which the Aero Club of America has offered a first prize of $20,000, has brought out the fact that there are, either constructed or under construction, 11 types of aeroplanes, each equipped with two motors, with power ranging between 180 h.p. and 320 h.p. Europe possesses only two or three types of twin-motored aeroplanes.

We submit that we express the public sentiment when we state that the people of this country are unanimous in demanding that adequate provision be made to organize a substantial air service. Members of both Houses of Congress have admitted that this branch of our defenses has been sorely neglected. The least that can be done now is to provide to compensate for past neglect.

Respectfully yours,

EXECUTIVE COMMITTEE, AERO CLUB OF AMERICA.
President.

Command of the Air for the United States

By Rear Admiral Robert E. Peary, Chairman, National Aerial Coast Patrol Commission

APRIL 30 in a letter to the New York *Times* I suggested the building of a fleet of sixteen 35-knot battle cruisers with their attendant destroyers, submarines, hydroaeroplanes, etc., in three years' time, to give us a fast, powerful, homogeneous fleet with every unit like the others in speed and guns, and to put our Navy in unquestioned second place.

The cost was estimated at $500,000,000 the equivalent of three weeks of present war cost to Great Britain alone, which would be our war cost if we get into war with a first-class European power or combination of powers.

May 3 the General Board submitted to Congress an estimate of $971,000,000 to put our Navy in second place in three years.

In this estimate were sixteen capital ships, ten cruisers and six dreadnoughts. There was also an estimate of $7,000,000 for "aircraft."

The Naval appropriation bills for the coming year, as reported from the House Naval Committee, provide for five battle cruisers, and appropriate $2,000,000 for aeronautics.

There is, therefore, now no chance of our securing second naval place within three years.

But the probabilities are that we may need our fullest strength by or before then to defend ourselves.

Is there any other way in which we can get ready effectively and quickly to defend ourselves against hostile foreign attacks?

If there is any way which gives promise of success, it lies in the air.

Few of the general public are aware of the astonishing recent development of aeronautics abroad.

The European war has probably forced that development as much as 20 years of peace, because it is a vital, life and death matter with the contestants.

It has been suggested that victory in the war may eventually be determined in the air.

Little Bulgaria, with an area somewhat greater than Maine, and a population less than Massachusetts, has over 300 aeroplanes.

The personnel of the British air service numbers more officers and men than we have in our entire Navy.

Germany has not less than 9,000 aeroplanes, and all these countries are constantly adding with feverish haste to their equipment in this department.

More machines have been lost in a month by France and Germany than we have in both our services.

The Ministries of these nations which have thousands of aeroplanes are constantly apologizing to the people of their countries for not being able to increase their air fleets fast enough to defend their country and protect the lives of their people.

The aeroplane has completely changed modern warfare.

Surprise attacks are no longer possible. And if one of the contestants can secure command of the air and deprive the other of it; conditions immediately become those of a fight between a blind man and one in possession of his eyes.

Our geographical position is a great asset.

An attack upon us must come by sea. Our coast line as a base gives us an inestimable advantage in aerial warfare, and will enable us to send out such a cloud of aeroplanes as will completely overwhelm and destroy any number of aeroplanes that can be transported on the decks of a hostile fleet, thus leaving us in the possession of our eyes and the enemy blinded.

A vital thing for this country is an Aerial Coast Defense System, over and beyond the aeronautical equipment of the Army and Navy, and one that shall not be dependent upon or subordinate to either the Navy or the Army.

The first essential in an aero defense of our coasts is to have on hand immediately—such a number of machines as will with certainty destroy the maximum number that can be brought here at one time by a hostile fleet and its transports.

It is, of course, impossible to fix on this number with precision, but with the present equipment in ships and aircraft possessed by several foreign countries, I can imagine an alert, and resourceful, commander bringing 500. It may be safe to figure on 1,000. If these numbers seem large, it must be remembered that the present war has thrown all previous ideas as to quantities and numbers to the winds.

With the aircraft of an attacking force eliminated, his means of reconnoissance, observation and information will be gone, and our own aircraft with only the enemy's anti-aircraft guns to look out for, can do much more effective bomb work on his fleet.

If the fleet escapes this attack, and attempts the landing of men and supplies, and ammunition by boats, then this gives another opportunity for attacking the enemy at a most critical period in their operations.

We should have at the very minimum not less than 2,000 seaplanes ready for duty on the Atlantic coast, and an equal number on the Pacific. Five thousand on each coast would be much better.

At each important place squadrons of aeroplanes should be parked like tents of the summer encampment of the National Guard.

What we want *immediately* is several hundred young men who know how to drive an aeroplane. Then we shall in a measure be prepared for an emergency. Those of special aptitude and intelligence can later be selected and trained still further for our permanent military aeronautical personnel.

We can get aeroplanes in an emergency more rapidly than we can get men to drive them.

One thousand dare devil young fellows who know just enough to handle their machines perfectly are worth more to us now than 500 highly trained young officers, though of course we shall need these as well.

The former class can be obtained in large numbers and trained in a few weeks. The other kind would require a year or more of training and would be more difficult to find.

And it is not desirable to delay too much by insisting on too long training or being too particular about material in order to get the highest grade of intelligence and training.

Some of the best foreign material has been uneducated, and for bomb attacks upon an enemy's fleet, or destroying a land-

(*Continued on page* 376)

A Roosevelt Administration, in 1907, at a time when aeroplanes were not yet publicly known to be capable of flight, with remarkable foresight and progressiveness, drew the specifications for an aeroplane, and gave the United States Army an aeroplane—two years before any other country took a similar step.

One who looks for a solution to the problem of organizing the air service needed for national defense finds that the only hope lies in another Roosevelt Administration.

The News of the Week

Aviation at Sheepshead Bay

The weather during the week's military tournament at Sheepshead Bay was generally unfavorable for aviation, but notwithstanding this fact, the aviators on the field made a splendid showing each day.

At the beginning of the week the large twin-motored J-N type Curtiss tractor was much in evidence, and created great interest. Steve MacGordon in the J N-2 Curtiss tractor made some excellent altitude flights. "Tex" Millman put the New Jersey Aeroplane Co. speedy monoplane through its paces; Katherine Stinson, in her own tractor biplane, looped and gyrated at night as well as during the day; Ruth Law, on the first Sunday of the meet, performed one of the most daring flights made by any aviatrice in the East; and Baxter Adams looped in his old-type Curtiss machine.

Rodman Law, who has leaped cliffs and climbed the walls of skyscrapers, produced a new thrill when he ascended in a balloon and exploded the gas inflated bag with a charge of dynamite. A parachute brought him to the ground safely with fragments of the blazing airship falling about him.

The baloon was A. Leo Stevens's Blue Bird, in which he flew from the top of Madison Square Garden a few weeks ago. It was filled with 12,500 cubic feet of hydrogen, besides which a heavy charge of explosive was placed in the bag. It was nearly dusk when Law ascended. He had barely reached a height of 300 feet when he touched off the fuse and jumped.

The prize winners of the aviation events were as follows:

Altitude: Victor Carlstrom, 14,500 feet; Ruth Law, 11,000 feet; Steve MacGordon, with two passengers, 8,500.

Bomb dropping: First, "Tex" Millman; second, Baxter Adams.

Second Altitude Contest: Steve MacGordon, 15,800 feet; Ruth Law, 11,200 feet.

Second Bomb Dropping Competition: First, Baxter Adams; second, "Tex" Millman.

Ruth Law got a special prize for bomb dropping offered by Capt. Thomas S. Baldwin.

Lawrence Sperry flew over the field on Friday in his Curtiss flying boat.

A Correction

Statements have been made in many directions that the Continental Motors Company, of Detroit, Michigan, is developing a motor for aeronautical uses. We have been asked by Mr. R. W. Judson, vice-president of the Continental Co., to state that these rumors are not founded on fact. Mr. Judson recently purchased a Model F Curtiss flying boat for his own use, and possibly this may have given rise to the stories.

Curtiss Records.

The twin J-N, on May 24 at the Sheepshead Bay Speedway, New York, piloted by Victor Carlstrom, established a speed record for that circular two-mile track which is considered excellent, especially in view of the fact that there was a strong side wind at the time. Circling the track ten times, totaling 20 miles, the elapsed time was 14 minutes, 21 seconds. The necessity for almost continual banking for the turns makes this record liable to stand for some time.

The R-2, driven by Steve MacGordon, on the same track, made the circuit for 20 miles in 15 minutes, 31 seconds.

The twin J-N also set a new altitude record for the Speedway, climbing with passenger 14,500 feet.

The Curtiss Speed Scout made better speed than the above but the record was not officially timed. Several laps were flown by this machine at a speed of 92 miles per hour.

Hall-Scott Eastern Representative

Mr. F. P. Whitaker, at 165 Broadway, has been appointed Eastern agent of the Hall-Scott Motor Co., whose headquarters are in San Francisco. Mr. Whitaker is in a position to give specifications, photographs and general information to interested parties.

The Naval Reserves

The six classes provided in the proposed new naval reserve plan are the fleet naval reserve, the naval reserve, the naval auxiliary reserve, the naval coast defense reserve, the volunteer naval reserve and the naval reserve flying corps. These classes cover every variety of marine activity from service on board the battleships to service on motor boat patrols. All reserve members are to be given $30 a month in time of peace and officers $60.

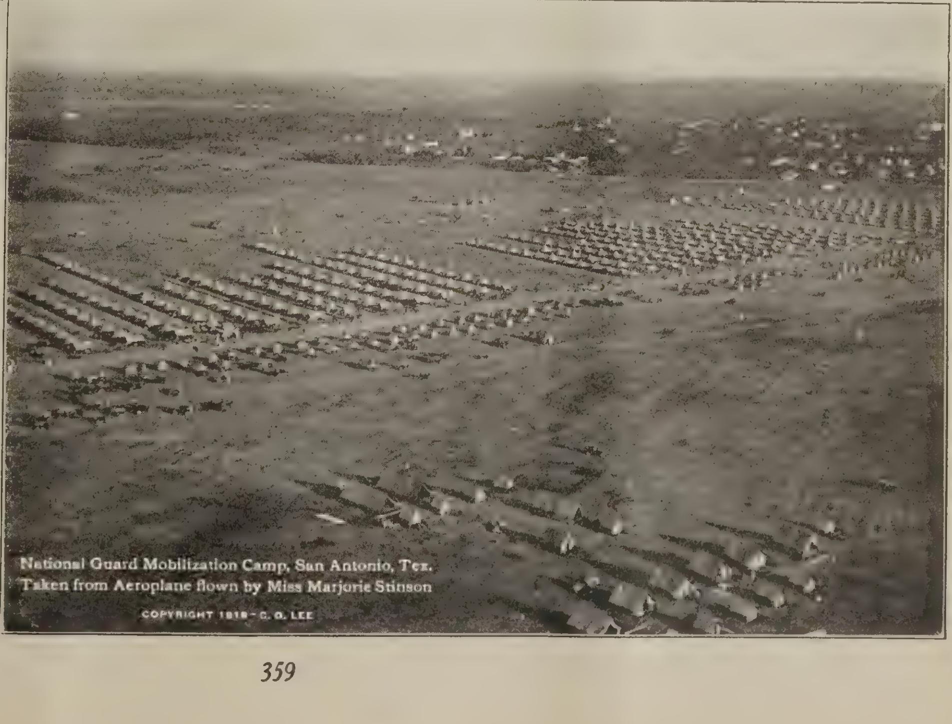
75 Air Scouts for Ships

Of the aviation appropriation the committee says:

"It is contemplated that the $2,000,000 recommended, in addition to providing for other aviation service, will eventually bring the number of service machines up to seventy-five, and as soon as the various ships are fitted up the machines will be put upon them. It must be remembered that the principal function of aviation for naval purposes is scouting in connection with the fleet, and for this purpose $2,000,000 at this time is deemed sufficient."

As a separate branch the naval flying corps is established by the bill, to consist of 150 officers and 350 men. The committee holds that it is not necessary that all navy flyers be graduates of Annapolis, but provides for the admission of expert civilian flyers.

A remarkable photograph of the National Guard Camp at San Antonio, Texas, taken from Miss Marjorie Stinson's aeroplane.


National Guard Mobilization Camp, San Antonio, Tex.
Taken from Aeroplane flown by Miss Marjorie Stinson
COPYRIGHT 1916 - C. O. LEE

Hall Scott News.

Capt. Vogelesang of the Dutch East Indian Colonies has just returned from a thorough inspection of aeroplane motor manufacturing concerns in the East. The reason for this trip was to select the best possible ninety h.p. motor for their Navy schools in India. Upon arrival at the Hall-Scott factory and after witnessing a most satisfactory test upon their latest type A-7, four-cylinder, 90 h.p. equipment, his quantity order was placed immediately.

Lieut. terPoorten recently arrived from the Dutch East Indies, where he has been most successful in long cross-country flights, as well as daily demonstrations of seaplanes. He used Hall-Scott type A-5 equipments entirely and reports excellent results.

Due to the success attained, the Colonial Government appropriated a large sum to thoroughly equip their country with seaplanes. Hall-Scott type A-5 equipments were specified and the order just recently placed.

Due to the large production of better than one type A-5 Hall-Scott motor per day, which has been maintained for the past two months, and shortly will be raised to two per day, the Hall-Scott Co. are in an excellent position to give prompt attention to quantity orders.

The Hall-Scott management reports that the orders which they now have on hand will keep them busy for the next eight months. New buildings are now being erected, and the production will shortly be twelve motors per week.

This company has perfected a four cylinder 90 h.p. motor with dimensions duplicating the six, a compelte description of which we will shortly present to our readers.

Shinnecock Aeroplane Company Formed

Mr. Samuel S. Pierce, late head instructor in the Bleriot School of France (the largest in the country), having in mind the great cost of aeroplanes, and the large amount charged for a course in flying, has conceived the idea of putting on the market a small sportsmen's aeroplane. With this in view, he has established the Shinnecock Aeroplane Company.

Mr. Pierce expects to correct the formerly accepted belief that aviation is a reckless pursuit followed only by daredevils who jeopardize their lives for hire. Those who have looked into the matter have found out that the wonderfully efficient flying corps of Europe have been developed more by popular enthusiasm than by direct governmental action, and that many of the most efficient fliers have acquired their skill in leisure hours.

Mr. Pierce has designed a machine of such strength of construction and such a combination of stability and controlability, that it will be one of the safest machines now made. It will measure twenty feet from tip to tip and seventeen feet in length and it is expected that it will be possible to be put on the market at a price of less than one-third of the average price now charged.

The machines will be on sale this summer and a school will be established on Long Island. Mr. Pierce will not use the dual control system so commonly used in this country, but the Bleriot system, which is universally followed abroad. The pupil will be put in a machine which runs along the ground only, and will be kept there until he has mastered the system of controls.

He will then be put in a machine capable of long low hops or very short flights. When he has shown himself to be efficient in these he will be permitted to make flights.

At the present time small machine are being constructed for training purposes and with a view of popularizing aviation. While retaining the fundamental principles of the school machines so successfully flown in France, they will be more substantially built, better finished, and equipped with a reliable motor designed for the machine. Their rate of climb and radius of action will be substantially the same as the military machines of the present day while their small size will permit them to be built at a small initial cost. The cost of upkeep will be very low and they can be housed in a small hangar.

Export of Aeroplanes

Exports of aeroplanes and parts were as follows during the week of May 22: To Russia, $66,647; to Great Britain, $138,531; to Venezuela, $243; total, $205,411.

Naval Aviator Killed

Lieut. James Vincent Rockwell, a civil engineer in the United States Navy, who was in training as an aviator at Pensacola, was killed May 24, when his Navy aeroplane dived 150 feet into the gulf. The machine was badly damaged.

The accident occurred just as Lieut. Rockwell was ending a trial flight. His three little children saw him fall. He was thirty-nine years old and was appointed to the service from Iowa.

Successful Wireless Experiment Made

Wireless communication with an aeroplane was put to a successful test at the naval aeronautical station at Pensacola for the first time when a Curtiss machine was sent up with an operator and a small wireless plant.

The wireless station at the navy yard kept in almost constant communication with the machine in the air. Due to the small plant, the communication was severed when the machine passed out of a radius of five miles.

Hall - Scott crankshafts in the rough and partly finished. The two big lathes shown run night and day. All of the crankshafts pass through those heat treatments.

Women to Learn Aeroplane Piloting

The American Women's League of Self Defense intends to operate two camps this summer at Huguenot Park, Staten Island, where women may learn the operation of aeroplanes. Mrs. L. C. Boardman, treasurer of the League, will be in charge of the camps and a certified pilot has already offered his services. The League has as members two women who are experienced fliers. Mrs. Boardman is of the opinion that as aeroplane flying requires no brute strength, but solely daring and a cool head, women can learn to operate them.

A Thomas Achievement

As we are about to go to press we have received telegraphic information of a remarkable flight made by a Thomas D-2 military tractor. This machine on May 29th, equipped with a Thomas aeromotor, made a continuous flight of three hours at an average speed of 85 miles per hour, covering approximately 250 miles. Frank Burnside piloted the machine.

Memorial to Capt. Knox

The memorial bronze to the late Capt. George Hyslop Knox, U. S. A., was unveiled on Sunday, May 28th, 1916, at four o'clock, on the family plot, Rose Hill Ave., Woodlawn. The Rev. Milo Gates, D.D., delivered the address. Three hundred people, including comrades and fellow members of the Aero Club, attended. It will be remembered that Captain Knox was instantly killed on August 12th, 1915, at Fort Sill, Okla., by the falling of the aeroplane on which he was flying as military observer.

Guns for Aeros in Mexico

Aeroplane machine guns and bomb dropping devices have arrived at Columbus for the first aero squadron. The aviators have been working for several weeks with new aeroplanes in an attempt to bring the fleet into condition for field work.

Cowan Has Fall

Captain Arthur S. Cowan, former commandant of the Army Aviation Training School here, fell fifty feet in a hydroaeroplane which he was piloting at San Diego.

The machine plunged into the bay near shore, and Captain Cowan, although badly shaken up, had no difficulty in extricating himself from the aircraft, which was partly wrecked.

Aeronautics at the Mass. "Tech" Anniversary

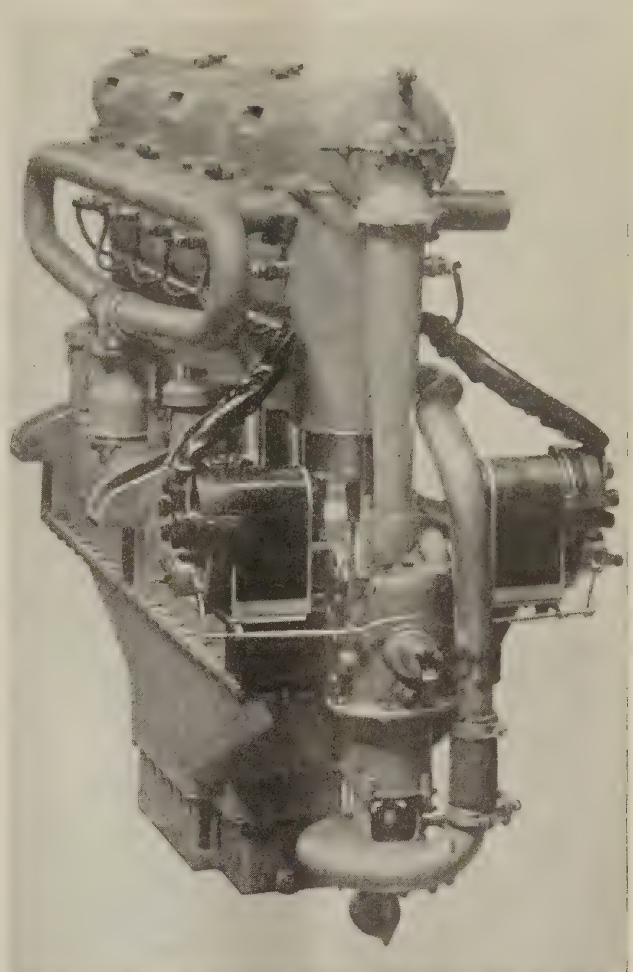
An Aeronautical Exhibition of great interest will be held in Cambridge on June 12th to 15th as a part of the Dedication of the new buildings of the Massachusetts Institute of Technology. The new "Tech" when completed will consist of a group of education buildings, dormitories, dining halls and athletic equipment which is estimated to cost $10,000,000.

One of the features of the new plant will be the aeronautical laboratories. The wind tunnel which has proved of such great service to American constructors under the able supervision of Lieut. J. C. Hunsaker will find a permanent place in the new building to be erected for the department of Naval Architecture. As Lieut. Hunsaker has been ordered back to Washington, the course in Aeronautical Engineering will be continued by Mr. A. Klemin. The new laboratories will also contain the most complete aeronautical motor testing apparatus in this country. This will be in charge of Prof. Jos. Riley, of the Department of Mechanical Engineering.

As "Tech" has led in this country in aeronautical instruction, it was considered fitting that aeronautics should have a prominent place in the "Fifty Years of Technology" Exhibit.

As yet it is impossible to announce the various interesting exhibits, but it is likely that the constructors and motor makers will make it one of the most instructive exhibitions ever held in his country.

Three important figures in the aero world have accepted invitations to be present: Mr. Orville Wright, Mr. Alexander Graham Bell and Mr. Alan R. Hawley. Among the graduates of "Tech" who are interested in aeronautics are Lieut. J. C. Hunsaker; E. M. Hagar, President of the Wright Co.; Godfrey L. Cabot, President of the Aero Club of New England; Chas B. Page, Vice-President and Treasurer, Van Blerck Motor Co.; Edgar M. Berliner, of the Gyro Motor Co.; Raymond Ware and George C. Abel, of The Thomas Company; Harry N. Atwood, of the Atwood Aeronautic Co.; L. D. Gardner; Leonard Wesson, of the Simplex Motor Company.



Three-quarter side view of the Christofferson Aircraft Motor.

Personal Paragraphs

John E. Sloane, contractor of the Sloane Military Aeroplane, has disposed of his interest in the Sloane Manufacturing Company, and has retired as its president.

Captain Hugh L. Willoughby has just returned from the Aeronautical School at Newport News, where he has been spending some time in flying the new army tractors under the instruction of MacGordon. He considers that the "Dep" control in these machines should be made standard over the world. As matters stand now, few aviators can jump on another man's machine and fly it.

Water-Cooled Engines Predominate

In the extension of the Allied aeroplane fleets, there has been an important slide to the fixed cylinder water-cooled six, eight and twelve-cylinder engines, to the detriment of the rotary types which held the board prior to the war. It is no secret that French, Italian and English firms have more or less faithfully copied the Mercedes six-cylinder water-cooled engine, which is practically identical in design to the 1914 Mercedes Grand Prix engines, one of which is now owned by Ralph de Palma (the automobile racer). The feature of these engines is steel cylinders with steel jackets and either two or four valves in the head, operated by an overhead camshaft. While some makers have produced an exact copy of the Mercedes, others have made detail improvements, and a few have produced the same type of engine with twelve cylinders. A respectable number of captured Mercedes aeroplane engines are in use on French aeroplanes, and many partly damaged engines have been put into service again after being repaired with spare parts from the French shops.

Hangar Constructed for Transatlantic Flier

A large hangar to house Rodman Wanamaker's big airship, the America, which will be tested at Newport News preliminary to an attempt to cross the Atlantic, was completed last week at the Atlantic Coast Aeronautical Station. Officials said that the flight probably would be started in October or November.

McCULLA LECTURES AT NORTH ISLAND

HOW it feels to be fired at with high explosive shells and shrapnel while flying in an Allied aeroplane over the German lines on the western front; of the damage sustained in London and in other sections of the British empire through Zeppelin raids, and of his experiences with the British and French flying corps during his stay of seven months in France, was related to the officers and men of the signal corps aviation school at North Island by W. R. McCulla, aircraft engineer of the Packard Motor Company. McCulla lectured to army aviation officers at the special request of the war department.

"I saw more aeroplanes in the air in France in five minutes than I have seen in the United States in seven years," was one of the remarkable statements made by McCulla. He declared that it was considered the height of folly and usually resulted in the pilot's and observer's death to cross the German lines while flying at less than 135 miles an hour at an altitude of 6,800 feet, because of the efficiency of German anti-aircraft guns and gunners. He said:

"This war has brought out in a striking manner the fact that a man must specialize in aeronautics, in engineering or in other lines if he is to be of any use in modern warfare. The war also has demonstrated that the day of the spectacular aviator for military purposes is past. Any pilot of the British Royal Flying Corps who is caught looping the loop is instantly discharged from the aviation service.

"At the request of Commander Briggs of the British Royal Flying Corps I made a trip of 450 miles in a new triplane. This triplane had a wing spread of 135 feet and weighed when fully loaded with bombs and fuel 102 pounds less than fifteen tons. It was equipped with four 350-horsepower motors—two pullers and two pushers—and carried a crew of six men. The triplane also was fitted with a motor for operating the wireless and for compressing air for the apparatus used in dropping bombs.

"The captain of this triplane was not an air pilot, but he was a skilled navigator, able always to find his way over sea and land to his objective point. The cruising radius of this machine is from 700 to 800 miles. The operator in charge of the triplane's radio apparatus must be a wizard, for he is compelled to receive messages in a code which is changed every 24 hours. This operator must also, while the triplane is in flight, keep in constant communication with from 15 to 18 batteries so as to be able to give them the range of hostile gunners and to flash immediately the result of the observer's observations along with other military information.

"The bombs carried by the Allied aeroplanes weigh 285 pounds, and they leave the firing tube at a speed of 680 feet a second, being released by compressed air. It is figured that by being given such an initial velocity the bombs are less likely to be deflected by air currents.

"The operator who has charge of the bomb dropping apparatus sits in an upholstered chair in front of which is a barometer which tells him the exact altitude at which the machine is flying, an air compressor gauge and an instrument showing the speed of the aeroplane. In addition to this, there is a board of curves showing the deflection of falling bombs at specified altitudes. The bomb dropping operator, as are the rest of the aeroplane crew, is in constant communication with the aeroplane captain by telephone, each person wearing a telephone receiver which is never taken off until the machine returns to its starting point. The captain tells the bomb operator when to prepare to drop his death-dealing missiles and tells him what kind to discharge—explosive or incendiary. The British have attained wonderful accuracy in this work.

"Reconnaissance aeroplanes employed by the British and French have a speed of 135 miles an hour. No American-made aeroplanes are used on the firing lines. Those machines which have been and are still being sent to Europe by American manufacturers are used exclusively in training work. They were found too slow for field service.

"The French and English scout planes are so constructed that the propeller may be shot away and still the pilot may be able to volplane with safety.

"Anti-aircraft gun construction is keeping pace with the development of aeronautics, and the field of activity of even the speediest aeroplanes is rapidly becoming limited, owing to the remarkable efficiency obtained by French and German gunners. While on the western front I saw three German fliers and one French flier brought down by aircraft guns. So accurate was the gun fire that rarely more than four shots were needed to bring the aeroplane tumbling to earth. The pilots are invariably killed by the concussion of the exploding shells and not by splinters of shrapnel.

"Only a small percentage of the wonderful deeds accomplished by heroic men in this war ever will be recorded. While I was with the British aerial corps near the German first line I saw 200 men volunteer to drive an armored caterpillar car into a German first line trench to cut away barbed wire entanglements. One man waas selected and he was literally riveted in the car. He succeeded in reaching the trench, smashing away a large section of barbed wire and cleared the way for an infantry attack. Thousands of high explosive shells struck the car and after the trench had been captured and the driver of the car released it was found that he had literally been reduced to a pulp by the terrific detonations, althoughunmarked by rifle or shell wound. I don't know how many men drove this car to their certain death, but they numbered many before I left this particular section of the front.

"The men who comprise the flying corps of England and France are superb specimens of manhood. They have to be or they cannot meet the requirements of the service. A heavy drinker or smoker is barred. One of the favorite tests is to suddenly fire several shots rapidly behind the applicant's neck and then test his blood pressure to see how he withstood the shock. While at Paris I saw one man 54 years old pass his pilot's test. The average age of the pilots, however, is between 20 and 30 years."

One of the polishing rooms at the Buffalo plant of the Curtiss Aeroplane & Motor Corporation.

NEW YORK TO WASHINGTON IN 187 MINUTES

CARRYING a letter to President Wilson, asking his endorsement of a plan to train 2,000 Militiamen, Coast Guardsmen, and mail carriers, from different States, Mr. Alan R. Hawley, President of the Aero Club of America, flew from Sheepshead Bay to Washington Thursday of last week.

The start was made at 7:23. The machine, piloted by Victor Carlstrom, was the big $10,000 twin-motored Curtiss battleplane, which made the Newport News to New York flight, and which has been acquired by the Aero Club of America for the National Guard of New Mexico, and is being sent to the Mexican border for service there.

They arrived at Washington and landed on the Polo Field there at 10:30 A. M., having beaten the fastest train by two hours. The machine was then driven under its own power up Seventeenth street to a place near the Army and Navy Building, where it will remain on exhibition until Saturday afternoon.

In his flight from Sheepshead Bay to Washington, Mr. Hawley carried a letter to President Wilson, which was delivered to the President at the White House. The letter read as follows:

HON. WOODROW WILSON,
The President of the United States,
Washington, D. C.

Dear Mr. President:

The Executive Committee of the Aero Club of America invites your endorsement of the proposal made to train, under Federal control, 2,000 men drawn from the forty-eight States in proportion to the population of each State, from the Militia, the Coast Guard, the Postal Service, and other similar national institutions.

These 2,000 men can be trained to pilot aeroplanes in about one year by immediately establishing ten Army and ten Navy aviation schools. The cost of training would probably amount to only $2,000,000—which represents but one-tenth of the cost of a modern dreadnought.

The Aero Club of America, which has paid for the training of about forty officers of the Militia of different States, has found that it costs about $400 for the actual training of each man until he qualifies for his pilot license. The Club has allowed $200 for each officer for personal expenses. These officers were trained at established schools. Therefore, the original cost of equipment was not figured, and must be added.

Part of this aerial reserve of 2,000, pricipally the officers of the Militia and Coast Guard, would become part of aviation detachments in the National Guard, Naval Militia and Coast Guard in different States. A fair percentage of the rest would probably qualify for admission in the Army and Navy air service. The balance could be organized as a reserve under the provisions made by the Army Reorganization Bill.

The swift adoption of aviation by the Militia is evidence that prompt responses can be expected. Last spring after Congress had adjourned and the international political situation grew serious enough to make the country take stock of its defenses and the manœuvres of the National Guard and Naval Militia of the States were being planned, it was found that in no case was an aeroplane to be employed—the reason being that there were no funds available to pay for aeroplanes or for training Militia officers in aviation.

Considering that at the time there were only about a dozen aeroplanes in commission in the Army and Navy combined, when we should have had one hundred times that number, and that there were no prospects of relief, since the last Congress had allowed but a fraction of the amount needed for aeronautics, conditions were very serious.

The Aero Club of America, the National Aeronautic body, which has fostered the development of aeronautics in America since 1905, realizing the necessity of bringing immediate relief, decided to wait no longer for the Government to do its duty. It took steps to contribute materially toward providing aeronautical equipment, and instituted the National Aeroplane Fund, for the purpose of developing aviation corps for the Militia of the States, and building an aeronautical reserve. The Militia was very prompt in its response, and to-day not less than 35 States are taking steps to organize aviation detachments.

These States are now anxious to organize aviation detachments in the National Guard and Naval Militia, and are applying to the Aero Club for assistance in getting aeroplanes and equipment. In most cases the Militia authorities have been trying for a long time to get aeroplanes, but have been unable to get them, on account of the lack of funds and inability to get assistance from either the War or the Navy Department.

It may be said truthfully of the Militia of every State that they will promptly organize aviation detachments if they are given the opportunity.

The training of Coast Guard officers and mail carriers would be a most progressive step, and would afford a valuable reserve of trained aviators which would be employed daily for peaceful purposes and would be valuable in time of war.

The Coast Guard can use aeroplanes for the purpose of saving life and property at sea and on the Great Lakes, and there are most difficult problems of mail transportation in the United States, which an aeroplane can solve easily and most economically.

The recent Mexican trouble and the Naval manœuvres at Guantanamo have shown that both the Army and the Navy have practically no aeronautical organization. The adoption of the plan to train 2,000 men and the entire cost of supplying the equipment for training them under Federal control and establishing substantial Army, Navy and Militia aeronautical organizations would cost not more than $5,000,000 for the Army; $5,000,000 for the Navy, and $3,000,000 for the National Guard and Naval Militia—making the total cost of giving the country a substantial aerial defense less than the cost of a single battleship!

At present the United States Army and Navy rank last from an aeronautical standpoint, not only among the nations, but also compared with the nations' colonies. The present provision for Naval aeronautics being only $3,000,000, would make the United States Navy rank twelfth; that is, behind England, Germany, France, Russia, Austria, Italy, Turkey, Bulgaria, Spain, Portugal and the Netherlands.

(Continued on page 379)

Mr. Alan R. Hawley, President of the Aero Club of America, starting on his air journey to Washington.

THE AERIAL DERBY

ON no other side is the national defense so weak as on that of aviation, whose vital importance is shown by the European war. No other side can be developed so quickly and cheaply as this through determined and adequate effort, and the competition being organized for the Pulitzer Trophy and other prizes promises to do more for this development than anything that has hitherto taken place.

The developments during the past week include the endorsement of the project by many Chambers of Commerce, many Congressmen, and the organization of an open air meeting at Mt. Kisco, under the auspices of the National Special Aid Society, the proceeds of which will be devoted to the competition. This meeting will be held in the open air theatre of Miss Marian Leonard. Rear Admiral Peary, and Mr. Henry Woodhouse, Governor of the Aero Club of America, will deliver addresses.

Mr. Woodhouse has arranged to have two of the aviators from Governors Island make a flight over the assemblage.

A demonstration of anti-aircraft guns, using streamers instead of real ammunition, also has been arranged. The old Guard Hill, which was used for signal fires during the Revolutionary War, will be the guiding point for the aviators.

Mrs. William Allen Bartlett, member of the Executive Board of the National Special Aid Society, who is keenly interested in aviation as a means of defense, said:

"Every one who is interested in preparedness is enthusiastic over this competition, and deeply grateful to Mr. Pulitzer for the plan of the transcontinental race, which has so stimulated national interest in the development of this wonderful science, sport and avenue of progress.

"The offering of the race trophy, and the campaign work of the Aero Club of America, will make shining pages in our national history when the records of these crucial years are compiled."

Mrs. Bartlett started a fund for the equipment and training of a corps of fifty aviators early last winter with a contribution of $500.

The most enthusiastic endorsement of the transcontinental aeroplane competition among the many received since the Pulitzer Trophy was announced, has come from Admiral Peary, as head of this committee. It follows:

"Dear Mr. Pulitzer: Your offer of a magnificent silver trophy to be competed for in a transcontinental aeroplane competition is a great stimulus to a movement that is growing by leaps and bounds, and it is in line with the advanced position *The World* always has taken in the aiding of aeronautics.

"As an aviation enthusiast and as Chairman of the National Aerial Coast Patrol Commission, which is advocating a complete aerial defense of our 5,000 miles of coast, like a national burglar alarm system, I most heartily and sincerely congratulate you for your part in the latest endeavor to put the United States back on the map as a leading aviation country.

"The pioneers in aeronautics cannot forget what *The World* did in the single year of 1910. It awarded Glenn H. Curtiss a prize of $10,000 for making the first flight between New York and Albany; it was the spirit behind the successful demonstration that bombs can be dropped with deadly effect on costly but helpless battleships; it inspired Eugene B. Ely to prove to a skeptical world the great value of aeroplanes as naval auxiliaries, when he flew back and forth from the deck of a battleship to the shore of Hampton Roads, being the first feat of its kind in history; it arranged with the St. Louis *Post-Dispatch* for a flight from St. Louis to New York, offering a prize of $30,000, which would have been paid gladly if the contestants had met all the requirements.

"Your proposal has caused the Aero Club of America—the pulsating heart, the eyes and the soul of aviation in this country—to set aside $20,000 from the National Aeroplane Fund, to which perhaps $80,000 more will be added by various organizations and individuals, and it pointed the way to the most remarkable Derby the world has ever known.

"This Derby will inspire hundreds of young and daring sportsmen to enlist in the American Army of Aeronautics, which has begun to grow at last; it will demonstrate that the only way for this science to reach its full fruition is for the people themselves to take a real interest in it; it will show that aviation will soon be as safe and as healthful as automobiling and yachting; it will set in motion the training of hundreds, and ultimately of thousands, of civilian aviators for use in time of war, and it will bring home to the American people as nothing else has done the great truth that the aeroplane is not only a fighting machine, but their good and useful friend in time of peace.

"Again expressing appreciation of what you have done in this important matter, speaking for the National Aerial Coast Patrol Commission as well as for myself, I beg to be remembered, very sincerely yours,

"ROBERT E. PEARY."

In the name of the scientific side of the aeronautic movement, Mr. Henry A. Wise Wood wrote:

"That this contest will have a distinctly beneficial effect upon the engineering aspects of flying is certain. It cannot fail to try out severely the best work that has been done, to make clear the defects which we are anxious to find and to point the ways to their removal.

"In order that it may be effective all laboratory development must be tested afield, the more rigid the tryout the better. You have provided the very best means by which this may be done—a hard, long-distance endurance test. For this the science and the industry will be in your debt.

"It is of such a project as yours that unforeseen engineering progress frequently is born. You are indeed a valued patron of the science of flight."

A letter from the President and Secretary of the Washington Chamber of Commerce to the Aero Club of America to-day extended the invitation of this city to bring the transcontinental aeroplane competition through the national capital. The letter says:

"The Chamber of Commerce of Washington extends to you a very cordial invitation to make this city the first overnight stop in your transcontinental aero race for the Pulitzer Trophy and other prizes.

"We will be glad, indeed, to extend every possible courtesy to the aviators and the Contest Committee.

"Permit us to remind you of the splendid landing place in the White Lot, immediately south of the White House, and the historic and political significance of the capital in connection with the first transcontinental aero contest, and the consequent publicity from the splendid corps of newspaper men located in the capital, representing the press of the entire country, as well as many foreign publications."

Washington, in competing with Philadelphia, Baltimore and Harrisburg for place on the aerial highway, urges its position as offering a moderate distance for the first leg of the race. The capital witnessed some of the earliest flights with heavier-than-air machines; was the home of Langley a great many years, and would have here to greet the aviators the heads of the Government whose interest it is hoped to stimulate by the big race.

Secretary Grant of the Chamber of Commerce will take up the matter of form, a general committee to urge the claims of Washington with the Executive Committee of the chamber this week.

Following up the striking object lesson from the delivery of a special edition of the New York *World* to official Washington by aerial express last week, the Aero Club of America have had on exhibition a K type Curtiss flying boat in front of the Geodetic Survey Building, which is across the street from the House of Representatives Office Building, where every legislator must see as he passes daily what kind of aircraft is being shipped from America to the Navies of Europe.

Senator Tillman, Chairman of the Naval Committee; James R. Mann, Republican leader of the House, and Representatives Clark of Florida, Dent of Alabama, Kreider of Pennsylvania, Garner of Texas, House of Kentucky, and Buchanan of Texas, are among those who made trips to inspect the hydroaeroplane.

Capt. Ralph Taylor of the Connecticut National Guard and Ensign Roger Van Kirk of the District Naval Militia were on hand to explain the fine points to all visitors, among whom were a number of Army and Navy officers and civilian engineers.

It is estimated that the big flyer has been visited by 2,500 Washingtonians in two days, hundreds of people made a trip to the machine as part of their Decoration Day activities.

THE IDEAL AERO WHEEL

THE Ideal Wheel Company, of Massillon, Ohio, of which Mr. Albert H. Ackerman, M. E., the well-known steel expert is the general manager, have just concluded a series of successful tests of their wheels at the laboratory of the Curtiss Aeroplane & Motor Corporation, at Buffalo. As the illustrations indicate, the wheel was attached to a large case, into which was loaded 1,500 pounds of sand. A side thrust blow, with the wheel seven feet removed from the point of contact, was calculated to give the wheel a stress of 27,000 pounds. This was when the wheel struck the plain floor surface. To test the wheel to its maximum two cleats of wood were nailed to the floor, four inches in advance of the striking point, and under this test four spokes of the wheel were broken. Calculation on the following basis showed that the energy of the blow totalled 49,800 pounds:

$W =$ weight in lbs. $= 1{,}500$

$F =$ force of blow, $29{,}700$

$V =$ velocity in ft. per sec.

$$\text{Then energy} = \frac{W\ V^2}{64.4} \text{ in.}$$

ft. lbs. $= 49{,}800$

The Ideal Wheel Company was formed in the fall of 1911 at Cincinnati, Ohio, at which time their first patents were issued on an automobile spring wheel. There was a manufacturing company formed and called the Ideal Spring Wheel, which started operations at Cincinnati. They manufactured under a license obtained from the Ideal Wheel Company and started manufacturing. The Ideal Wheel Company, being the owners of the patents, continued to experiment and obtained improvements upon their first patents. By improving and testing of their wheel up to March, 1912, they brought up another new design for which patents were issued. This wheel went on the market and was manufactured for automobiles. Since 1912 they have continually carried on experimental work up until March, 1915, when Mr. A. W. Ferrian brought out his first new motorcycle spring wheel. In December, 1915, the Ideal Wheel Company started to manufacture and located their plant at Massillon, Ohio. Up to this time the only difficulties they had were getting the springs tempered properly to stand the fatigue subject to what the springs would give used in constant contact with vibrations. These experiments found that the design of the wheel was perfect, but the tempering of the steel was the problem to overcome.

Accordingly, they consulted Mr. Ackerman regarding his treating and tempering the steel to stand the fatigue and give them the resiliency they required. After several hundred tests it was discovered it could practically be accomplished, at which time Mr. Ackerman improved several designs of their motor cycle wheel, and made the present aeroplane wheel, which was patented in conjunction with Mr. Ferrian's patents.

After exhaustive tests a special alloy, specially treated, had to be used to meet the conditions that the wheel was subject to getting at all times. The steel receives a special process in the treating, so that it will give the required resiliency, starting at the centre of the curve and gradually growing stiffer and stronger both to the hub and relative to the structure of the spoke. The spokes being made on the curve, they are hung on the hinge at the rim, being a unit in the hub, allowing them to open and shut according to the load placed on the hub.

Mr. Albert H. Ackerman, General Manager Ideal Wheel Co.

In the aeroplane wheel it is found that the hub will leave the centre four inches when maximum loaded, and return to centre as load is decreased, without the springs taking a set. There has never been a spring wheel invented which would meet any such conditions.

These wheels can be built according to size and weight of any load from 500 pounds up.

Mr. Ackerman took the general management of the company, and personally became interested at the beginning of this year. The general manager is experienced as a mechanical engineer, and is expert on heat treating, having had thirty years' experience, being connected as an expert in heat treating with the largest steel companies in this country. He has a broad acquaintance in the West and Middle States and a known reputation on heat treating.

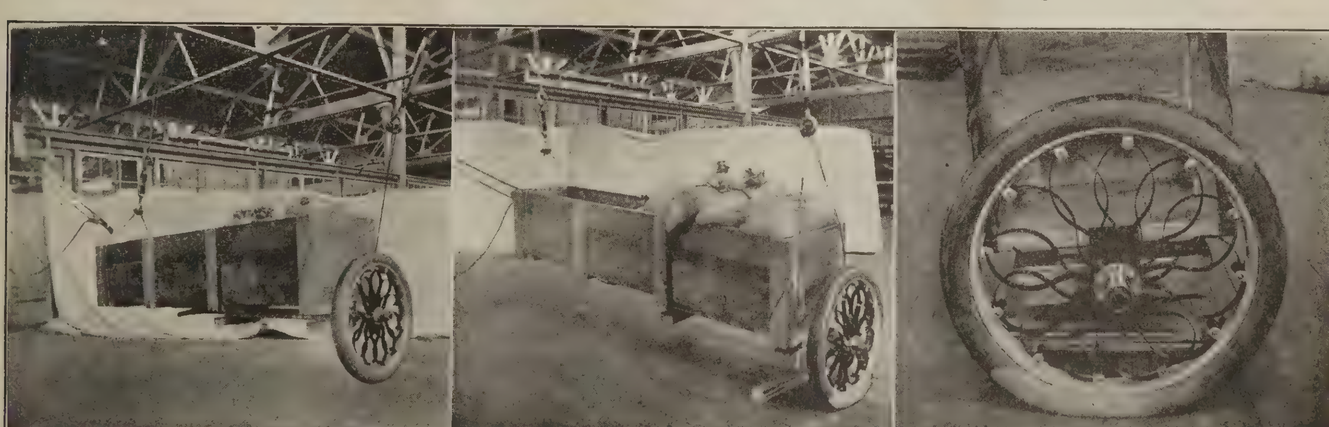


Figure 1. Figure 2. Figure 3.

NAVAL AERONAUTICS

By GODFREY L. CABOT

THE recent gun practice at Guantanamo Bay, in which avaitors carried by the ship North Carolina accomplished remarkable results in directing gun fire, established beyond all doubt the immense importance to the American Navy of equipping at least twenty-four ships with the needful apparatus for the launching of aeroplanes while at sea and under conditions which prevent their rising from the water.

The first cost of an equipment sufficient for twenty-four ships would be about $3,800,000. The total personnel would be 120 commissioned officers and 2,640 enlisted men, and such a group would increase incalculably the fighting ability of our ships of war.

Take, for instance, the range of 18,000 yards. At this distance the surface of the sea is not visible from the deck of a battleship, and even from its top the observers are unable to tell within two or three miles how much a shot falls short of the target and range-finding at such a distance is necessarily inaccurate and more or less affected by atmospheric conditions owing to the refraction of the air, particularly on hot, sunshiny days and the motion of the point of which you are trying to find the range. Whereas, on the contrary, from an aviator flying a mile or two miles above a battleship, it is perfectly easy to tell within the length of a battleship the distance by which a shot or a salvo of artillery falls short of the mark.

Now at this range in the recent practice incomparably better results were obtained as to marksmanship than at much shorter ranges in the world-famous battle of Santiago in which the American Navy achieved the best marksmanship attained in actual warfare up to that time.

Under ordinary sea conditions the use of aviation control unquestionably increases by a very considerable percentage the effective range of the guns of a battleship, but if the conditions are somewhat abnormal, for instance, by reason of fog, between the contesting parties or over either fleet, the advantage of having an aviator incomparably increases, and it is easy to see that with a fog between the two combatants it might happen that one fleet would absolutely demolish another without the opportunity of any effective reply.

Furthermore, in any naval battle as the battle proceeds, the smoke from the funnels of the contesting ships and also the smoke from the powder which is not, by any means, a negligible amount with the so-called smokeless powder, causes an increasing obscuration between the actual contestants, so that as the battle proceeds the advantage of aviators is constantly increasing.

It should not be forgotten that it is not simply a question of having aviators; it is also a question of keeping them in the air. Therefore, a ship that by reason of superior appliances or greater skill on the part of its aviators can put its aviators into the air when the conditions are so rough as to prevent its opponent from doing the same will have the same advantages as if its opponent did not have any aviator. Hence, the need of the most up-to-date appliances and the most skillful men and of constant or at least frequent practice whereby both men and appliances shall be kept in a state of efficiency.

The plan is to have three (3) types of flying machines: One simply for observation, of which there will be two for each ship; one for fighting in the air, of which there will be two to each ship, and the last type will be a torpedo-carrying type of which there will be one to each ship.

Now we can appreciate the situation if an adverse fleet is in fog such as to conceal from the personnel of the adverse fleet the motions of the aviators, but the smoke of the fleet or the column of hot-air arising from this smoke would in any ordinary fog betray their presence to the aviator.

Under these circumstances it seems perfectly feasible for a torpedo-carrying aviator to drop a torpedo close to a vessel in such a way as to sink it while there is comparatively little danger to the aviator. The importance of this consideration is emphasized by the extreme difficulty of aiming a bomb or dropping a torpedo or some other missile from a flying machine at a great height with any reasonable expectation of hitting a mark smaller than a city.

The stories that have come to us from time to time of accurate marksmanship with bombs in Europe are exaggerated. It seems after careful consideration and careful personal observation on no less than seven different flying machines absolutely inconceivable that any accurate marksmanship could be achieved in the dropping of bombs from a great height and this is the personal opinion of every aviator with whom the undersigned has talked and among them are numbered some of the best aviators in the Navy.

It is conceivable that by means of a gyroscopic horizon the bomb might be aimed with some approximation to accuracy as to the angle of inclination, but there can be, under no circumstances, any likelihood that at a height of 7,000 to 10,000 feet, speed relative to the mark can be accurately gauged. At such a height, I say, there seems no possibility of calculating with accuracy the effect of the horizontal speed at which the bomb is released.

In actual test, even the most skillful fliers in the Navy are usually unable to hit the mark by 100 feet, even at very much lower elevation than it will be safe to fly in actual warfare. Now these men are so skillful that to the passenger there seems to be absolute stability of the machine, and I do not believe that much improvement can be made excepting by a gyroscopic horizon which would be very heavy and only practically available on very large machines.

Therefore, it seems to me that the main feature in the use of hydro-aeroplanes is first, observation; second, attacking aircraft in the air, and if possible driving the enemy's aviators away; and third, taking advantage of fog to attack battleships when circumstances make it possible to approach close to them without the certainty of being destroyed.

Important as the use of aviators is in land manœuvres, it is even more essential in the case of naval engagements. First, because instead of having a fixed target of which the location may perhaps be absolutely known by reason of an accurate map, as in the case of land operations, your target is always on the move; not located on any map and, therefore, a matter of observation; and second, because it is much more possible that conditions may arise where superior skill may enable one combatant to put fighters in the air when the other combatant cannot; and third, because attack under cover of a fog is far more effective or should, it seems to me, be far more effective on the water than on the land.

Your target on the land is usually a battery which you cannot see in fog, whereas the battleship makes its presence known by smoke, or by hot-air currents even when the fog is so thick it absolutely screens the ship itself from all observation.

Furthermore, of course, fogs are much more common at sea than on land.

I hope that this article will impress upon your many readers the importance of doing what they can to hold up the hands of the Navy and obtain for them by pressure upon Congress the appliances and men which they need.

A Good Bill

Congressman Kahn has introduced a bill in the House of Representatives which has several good points, the chief one being a proposition to eliminate the present absurd age clause in the regulations of the Signal Corps. The bill reads:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That when it is impracticable to obtain the total number of officers for the aviation section of the Signal Corps from the Army, the difference between the number of officers actually on duty in the aviation section and the total number of officers authorized for the aviation section by law shall be made up by the appointment of aviators, Signal Corps, which enlisted grade is hereby created. The personnel for said grade to be obtained from suitable enlisted men of the aviation section of the Signal Corps or especially qualified civilians who may be enlisted for that purpose: *Provided,* That whenever an aviator's services become unsatisfactory he may be returned to his former enlisted grade or discharged from the Army. The base pay of aviator shall be $150 per month and the allowances of a master signal electrician, with the same percentage of increase in pay for length of service as is allowed a master signal electrician. That the number of enlisted men to be instructed in the art of flying shall be fixed from time to time by the Secretary of War: *Provided further,* That the provision contained in the aviation law of nineteen hundred and fourteen relating to age, marital condition, or rank being a bar to the detail or redetail of officers of the line of the Army to the aviation section is hereby abolished."

THE UNIVERSITY OF MICHIGAN COURSE IN AERONAUTICS

THE faculty of the College of Engineering of the University of Michigan is developing the course in aeronautics which they offer and it is to be their endeavor to make it as comprehensive as possible. It is expected that the students will gain much information and also practical experience in connection with the work done at the Packard Motor Car Company of Detroit. The aim of the course is to teach the theory of aeroplanes and to enable students to secure positions in manufacturing plants.

The course is under the direction of Professor H. C. Sadler and Assistant Professor Felix Pawlowski, one of our contributing technical editors. The summary of the course is as follows:

1. General Aeronautics. Lectures and recitations. *Two hours.* First semester.

   An introductory course giving the essential principles of aeronautics (balloons, dirigibles, ornithopters, helicopthers, aeroplanes, helicoplanes and kites), history of flight and description of modern aircraft.

   Open to junior students. Must be preceded by E. M. 2 and 3.

2. Theory of Aviation. Lectures and recitations. *Two hours.* Second semester.

   The course deals with the following questions: properties of the air, general discussion of aerodynamics, aerodynamical properties of planes and various constructive elements of an aeroplane, power necessary for flight, equilibrium of aeroplanes, stability of aeroplanes, air currents.

   Must be preceded by Course 1.

3. Theory and Design of Propellers. Lectures, recitations and drawing. *Two hours.* First semester.

   Theory of propellers on the Drzewiecki system; Eiffel's method of propeller analysis and graphical method of determining propellers for specified conditions; strength of propellers and influence of gyrostatic moments in quick turns. The student will design a propeller and analyze the distribution of stresses in the blades. Must be preceded by Course 2.

4. Aeroplane Design. Lectures and drawing. *Three hours.* First semester.

   This course includes the investigation of the design of the aeroplane from the aeronautical and strength standpoints. The strength and design of all the detail are discussed and a completed design prepared.

   Must be preceded or accompanied by Course 3 and preceded by M. E. 6.

5. Aerodynamic Laboratory. *One hour.* Second semester.

   An elementary course covering use of instruments, investigation of aerodynamical properties of the various bodies used in aeroplanes and airships, test of propellers.

   Must be preceded or accompanied by Courses 2 and 3, and preceded by M. E. 7.

6. Design of Aeronautical Motors. Lectures and drawing. *Two hours.* Second semester.

   Complementary course to M. E. 15, dealing with special features of the aeronautical motors, critical study of various types of motors and design of a complete motor of certain type.

   Must be preceded by M. E. 15.

7. Theory of Balloons and Dirigibles. Lectures and recitations. *Two hours.*

   Study of equilibrium and stability of spherical balloons and dirigibles; description of French, German and Italian types; resistance and propulsion, dynamical stablity of dirigibles; operation and maintenance of balloons and dirigibles.

   Must be preceded by Courses 1, 2, and 3.

8. Design of Balloons and Dirigibles. Lectures and drawing. *Two hours.*

   Investigation of the design of a balloon and a dirigible from the aeronautical and strength standpoints. Questions of strength and design of all the details of the non-rigid, semi-rigid, and rigid types are discussed and a completed design of one type prepared.

   Must be preceded by Course 7.

9. Theory and Design of Kites. Lectures, recitations and drawing. *Two hours.*

   Critical study of various types of man-carrying kites and the launching devices. Investigation of the design from the aeronautical and strength standpoints. Completed design of a kite train of one type is prepared.

   Must be preceded by Courses 1, 2, and 7.

10. Design of Aerodromes and Hangars. Lectures, recitations and drawing. *Two hours.*

    Planning and equipment of aerodromes and aero-ports; construction of transportable, stationary, revolving and floating hangars. Completed design of one type is prepared.

    Must be preceded by Courses 2 and 7.

11. Advanced Stability. Lectures and recitations. Advanced study of more complicated phenomena of stability according to Ferber, Bothesat, Bryan, and Bairstow.

    Must be preceded by Course 2 and Math. 9 (Differential Equations).

12. Aeronautics. Advanced Reading and Seminary.

13. Aeronautics. Advanced Design.

14. Aeronautics. Advanced Research.

The program which students taking the complete course have to take is as follows:

FIRST YEAR

FIRST SEMESTER		SECOND SEMESTER	
* Modern Language	4	* Modern Language	4
Gen. Chem. (2E), or Engl. 1	5 or 4	Engl. or Gen. Chem. (2E)	4 or 5
Alg. and Anal. Geom. (Math. 1)	4	Alg. and Anal. Geom. (Math. 2)	4
Shop 1 or 2 and Des. Geom. 4	4	Des. Geom. 5 and Shop 1 or 2	4
Total hours	17 or 16	Total hours	16 or 17

SECOND YEAR

* Language	4	* Language	4
Calculus I (Math. 3E)	5	Calculus II (Math. 4E)	5
Mech., Sound, Heat (Phys. 1E)	5	Magn., Elec., Lt. (Phys. 2E)	5
Surveying 4	2	Kinematics, etc. (E. M. 1)	4
Machine Draw. (M. E. 1)	2		
Total hours	18	Total hours	18

SUMMER SESSION

Shop 3	4
Elect. App. I (E.E. 2)	4
Total hours	8

THIRD YEAR

Shop 4	4	Hydromechanics (E. M. 4)	2
Strength, Elec. (E. M. 2)	3	Thermodyamics (M.E.) 5)	3
Dynamics (E. M. 3)	3	Machine Design (M. E. 6)	4
El. Mach. Des. (M. E. 2)	3	Eng. Materials (Ch. E. 1)	3
Heat Engines (M. E. 3)	4	Theory of Struct. (C. E. 2)	3
Gen. Aeronautics (Aero. 1)	2	Theory of Avia. (Aero. 2)	2
Total hours	19	Total hours	17

FOURTH YEAR

Mech. Lab. (M. E. 7)	2	English 5, 6, 9 or 10	2
Internal Com. Eng. (M. E. 15)	3	Mech. Lab. (M. E. 32)	2
Theory and Design of Propell. (Aero. 3)	2	Aerodynam. Lab. (Aero. 5)	1
Aeropl. Design (Aero. 4)	3	Design of Aeronaut. Mod. (Aero. 6)	2
Elective	5	Elective	5
Total hours	15	Total hours	12

THE VERVILLE TYPE FLYING BOAT

THE Verville Type Flying Boat, designed by Alfred V. Verville, of the General Aeroplane Co., Detroit, Mich., has been thoroughly and successfully tested out in four hours of actual flying performance on Lake St. Clair. Mr. Jay D. Smith piloted the machine through these tests.

An aviation class of twenty students are to commence their lessons at once.

The designer's aim has been to produce a machine conforming with the best principles of construction and design conducive to efficient performance, and only practical and proven features are embodied. All the materials are carefully selected from the finest stock, with high elastic limit in tensile strength.

General Dimensions

Span, top, 38 feet; bottom, 36 feet.
Gap, 6 feet.
Chord, 5 feet.
Gliding angle, 1 in 7.
Length over all, 27.9 feet.
Rudder, 8 square feet.
Ailerons, 40 square feet.
Elevator, 18 square feet.
Stabilizer, 18 square feet.
Weight, unloaded, 1,450 pounds.
Weight, loaded, 2,050 pounds.
Fuel capacity, 3-6 hours.
Speed range, fully loaded, 42-70 m.p.h.

Hull

Honduras mahogany; concave "V" bottom with off-sheared deck and "D" shaped tail. Load water line displacement, 2,000 pounds. Displacement bow and four watertight compartments; double planked, aluminum bulkheads; aluminum handhole covers, rendering access to any part. Accommodation for pilot and passenger in a roomy cockpit, well upholstered with green leather, filled with "kapok." Cockpits veneered with ⅛ inch Honduras mahogany. Dashboard of polished mahogany, equipped with altitude barometer recording to 15,000 feet, inclinometer, speed indicator, all of "Tycos" make; "Tel" tachometer; gas tank pressure gauge, oil pressure gauge, electric light gang switch, dashboard light, motor cutout switch, hand throttle and magneto spark control; four special Tungsten cells for lighting; hand pump convenient to pilot from side of cockpit.

Wing floats of mahogany, streamline sections, each having a displacement capacity of 200 pounds.

Controls, 3 in 1 type, Depperdusin or Curtiss.

Planes

The wings are of efficient Eiffel section. Spruce wing spars; ash compression ribs; spruce wegs and cap strips. Shelby oval steel tube trailing edge. Strong internal drift wire bracing of Roebling aviator wire. Covering of unbleached Irish linen having strength in weft of 91 pounds per linear inch, and in warp of 103 pounds; doped with nine coats of Emaillite, and surfaced with three coats of spar varnish.

Struts of well seasoned Virginia silver spruce shellacked and coated with three rubbed coats of spar varnish; ends copper tipped, and bound with grey silk ribbon to relieve shattering. Strut fastenings are wrapped around wing spars, obviating the disadvanttage of the conventional fastening by bolts and piercing of beam, thus offering advantage of lift cable tension from neutral axis of wing spars.

Ailerons

Hinged to extremity of top wing at rear spar by five steel hinges; two sets of pylons near aileron leading edge, housed in steel casing. Equalizing aileron controls run through aluminum pulley boxes and fair leaders, along front spar of top wing. Lynite pulley used, having brass bushings.

Motor Group

100 H.P. Curtiss O-XX or 8 cylinder V type Maximotor, 4 cycle, equipped with Bosch magneto, Zenith double throat carbureter and "Bougie Mercedes" spark plugs. Carter injection feed system to motor.

Paragon propeller, directly connected to motor 8′-3″ diameter, 5′-6″ pitch, 3 blade, oak, flexing, copper tipped.

Radiator, nickel plated brass casing; copper flat tube cellular type. Water capacity, 2½ gallons; net weight, 41 pounds.

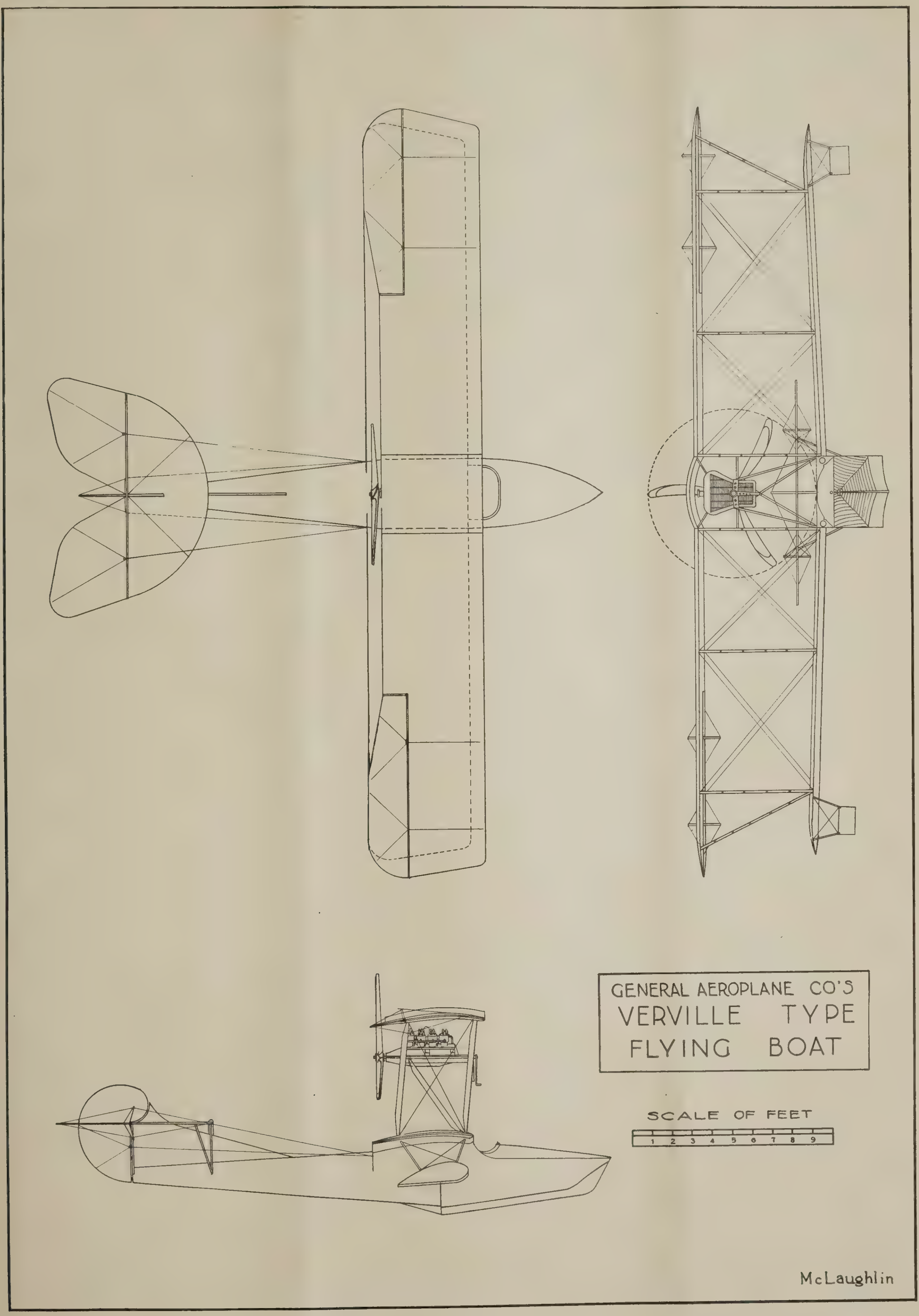
Fuel tank, capacity 25 gallons. Tern-coated steel, equipped with baffle plates, capacity gauge, pressure gauge, auxiliary pump connections, carbureter outlet and air-tight brass filler cap.

General

Factor of safety of seven throughout the machine; double wires throughout and factor of safety taken on one cable. French "National" turnbuckles used exclusively. All cable wrapped with copper wire, sweated with solder and at least three inches long. Control cable extra flexible 19 strand cotton center Roebling grade wire.

Hull finished in natural or stain, oil rubbed. Metal parts either nickel or treated with non-corroding metal enamel.

The Verville flying boat after a flight over Lake St. Clair.


GENERAL AEROPLANE CO'S
VERVILLE TYPE
FLYING BOAT
SCALE OF FEET
1 2 3 4 5 6 7 8 9
McLaughlin

FOREIGN NEWS

FRANCE

In a fight between the American aviators with the French Army and a number of German aeroplanes, three of the German machines were brought down. At 8:30 in the morning the entire American division went out scouting over the German lines. A bullet hit Corporal Rockwell's windshield and he was slightly injured by the flying lead. Lieutenant Thaw's machine received several bullets, one of which hit him on the elbow, breaking a small bone. He is now in Paris on a short rest. Corporal Chapman engaged two aviatiks and put them to flight. Sergeant Cowdin had two fights, one resulting in the downing of a German machine.

Fred Prince, Willis Haviland, of Chicago, and Paul Rockwell, of Cincinnati, have received brevets and are finishing their schooling at Pau.

Six German aeroplanes and six German captive balloons destroyed were part of the results achieved by French aviators, according to the official reports of May 22nd. The night report tells of a French machine pursuing and destroying one of the German aeroplanes used in the last attack upon Dunkirk, and of two German aeroplanes being shot down in an air battle in Alcase.

"In the region of Verdun," says the day report, "French aviators have attacked a number of captive balloons. Six of these were sent down on fire."

It also says that one French aviator attacked two air machines of the enemy and destroyed them in the vicinity of Eparges, while another French flier vanquished an enemy aeroplane in an air battle. The report mentions bombing expeditions of French fliers on the nights of May 20, 21 and 22.

William Thaw, the American aviator, has brought down his fifth German aeroplane. After an encounter with the German he was told that the aeroplane had been brought down. He said: "Well, if I got that one I have finished five since I began flying in a chasing machine."

A thrilling aerial battle, in which one French machine triumphed over three German 'planes, destroying one, and the bringing down of two other Teuton fliers were recounted by the Paris War Office on May 23.

"In the region of Furnes," says the statement, "a German aeroplane struck by the machine gun fire of one of ours was brought down in our lines near Beaumont. An aviatik, seriously hit in the course of an aerial fight, fell within the enemy lines. In the region of the Linge River one of our pilots, attacked by three enemy aeroplanes, brought down one of his adversaries and drove the other two to flight."

Bert Hall, one of the American aviators with the French Army, attacked a German aeroplane the 22nd of May and brought it down from a height of 13,000 feet. He followed it down 3,000 feet and saw it smash on the ground, just within the German lines. His own machine was hit.

The following is from an official French report dated May 25th: "In an aerial fight one of our pilots brought down a Fokker, which fell within the enemy lines to the north of Vaux. In the region of Etain one of our squadrons gave battle to a group of German aeroplanes. Two of the enemy machines, seriously hit, were compelled to make a landing."

Sergeant Kiffin Rockwell, of Atlanta, Ga., of the Franco-American Flying Corps, has returned to Verdun after having been in Paris for twenty-four hours. During that time he had extracted from his face and around his nose the splinters from a bullet which hit the framework of his aeroplane when he shot down his second German machine during the battle of Verdun. Sergeant Rockwell, who has been proposed for the Military Medal, besides the War Cross, refused an invitation to remain in the hospital.

"The German and French big shells passed us almost without interruption, rocking our machine," said Rockwell, describing air work about Douaumont. "One French aviator, who was determined upon identifying the Bavarian division in the course of the fighting, came down so low that he actually grazed the tips of their bayonets, yet he shot up again so quickly that he was able to escape."

GERMANY

In the official German report for May 22nd, it is claimed that German aviators have recently brought down seven French and British aeroplanes.

"Our air squadrons," it says, "repeated their attacks, with visibly great success, on the harbor of Dunkirk. A biplane of the enemy fell into the sea after a fight. Four other aeroplanes were disabled in aerial combat and fell within our lines, one in the vicinity of Werique, another near Noyon, the third near Maucourt, and the fourth northeast of Cateau Salins.

"The last named was shot down by Lieutenant Wintgens, who thus disabled his fourth aeroplane.

"In addition to those mentioned, First Lieutenant Boelke has brought down his seventeenth and eighteenth hostile aeroplanes, one south of Avocourt and the other south of Dead Man Hill.

"This brilliant aviator has been promoted by the Emperor to the rank of captain in acknowledgement of his achievements."

The Zeppelin L. Z. 77, which was recently brought down in France, was found to be driven by four six-cylinder Maybach engines. The bore was 7⅛ x 8⅝ stroke (inches). Each engine weighed 990 lbs. The anti-aircraft gun which brought down the Zeppelin was a 75 mm. field piece designed for high angle fire, firing incendiary shells. The chassis is a modified three-ton truck built by both De Dion and Schneider. The gun is mounted on a revolving platform.

In the month of April the Germans claim to have brought down twelve British aeroplanes and twenty French aeroplanes.

The largest Zeppelin ever tested was seen recently in maneuvers over Lake Constance. It measures 780 feet in length and has four armored cars and seven propellers.

GREAT BRITAIN

The British claim that in the month of May, by official English reports, twenty-one German and Austrian aeroplanes were brought down. The French, basing their claims on the same information, claim to have brought down thirty-four German aeroplanes in the same period.

Along with the development of airships of the Zeppelin type in Great Britain (the English now admit their worth in scouting, etc.), the authorities are paying special attention to the development of guns of higher calibre than are used in aeroplanes. The main difficulties that stand in the way are that in the first place, the guns must not have too great a recoil and that some way must be found of keeping the flame which comes from the guns from igniting the hydrogen which is continually oozing from the bag. Invention is at work on both of these difficulties.

According to *The Aeroplane*, the British Air Service is not giving complete satisfaction. In the case of the Zeppelin which fell recently the Admiralty gave out reports that "The ship came down in flames, and there were no survivors." To quote from *The Aeroplane:*

"It may cheer the British Nation to present to it by suggestion a glowing mental picture of a Zeppelin hurtling to earth a glowing mass after a single shot, but it does not increase the nation's confidence in its rulers or its defenders when it is found out that it is doubtful whether it was British or French gunnery which, after a lot of promiscuous shooting, so damaged the airship that it had to come down, after which the crew set it alight and escaped only till captured by the army, let us hope."

It is thought that the Zeppeline menace in England is not accomplishing as much as was expected. The losses in Zeppelins have been heavy while the results of the numerous raids have had absolutely no other effect other than killing innocent non-combatants. So far as is know in England, the Germans have lost twenty-two airships since the beginning of the war. Although it was recently claimed that the Zeppelin factories were turning out one airship a week, the English authorities state positively that Germany can not finish more than one full-rigged airship a week.

On May 24th debate in the House of Lords was resumed on the aerial service. Looking at the rise of the nation's air service from almost nothing at the beginning of the war, Lord Curzon said that he considered it an enterprise second to none in the world, and believed that it would not suffer in comparison with the German aerial service.

Lord Curzon then announced that the new aerial board to advise the Admiralty and the War Office, of which Lord Curzon is chairman, would comprise: Read Admiral Frederick Charles Tudor, Rear Admiral Charles L. Vaugh-Lee, Major General Sir David Henderson, General W. S. Brancker, Lord Sydenham and Major Baird.

British aeroplanes recently threw bombs on a large body of men fleeing from El Fasher (500 miles west of Omdurman). The chief of the men, Ali Dinar, was seen at the head of the men and they were facing a march of one and a half days across a waterless desert.

ITALY

According to an official Italian report of May 22nd, an Italian Naval Flying Squadron defeated and burned an enemy aeroplane in the upper Adriatic on May 21st.

An Austrian aeroplane and an Austrian gunboat have been destroyed in an engagement with an Italian gunboat in the upper Adriatic. The crew of the Austrian craft were taken prisoner.

A building on the outskirts of Porto Ferrajo was bombarded by an Austrian submarine, which was driven off by the coast batteries before much damage was done.

An Italian non-commissioned officer of engineers has invented a special telemeter for anti-aircraft guns, whose aim is automatically rendered practically unerring.

For obvious reasons a detailed description of this wonderful device, which has been adopted in all the allied armies, cannot be given. It consists of a mirror attached to the gun in which the object fired at, aeroplane or airship, is reflected in such a way that the gunner is enabled not only to determine automatically the distance between the gun and the target but to calculate the speed of the aircraft.

The mirror is graduated so that the distance and the speed of the target can be ascertained at a glance, and no time or ammunition is lost. Provided the enemy aircraft is within firing range, and the range of the anti-aircraft gun has been considerably increased of late, the chances of its being missed when the special telemeter is used are reduced to less than 1 per cent.

Three out of five seaplanes were brought down during a recent air raid at Ancona and about eight Austrian aeroplanes were hit and destroyed or captured a few weeks ago at the front.

The Italian Report for May 1st is as follows:

"On May 30 one of our Caproni squadrons dropped bombs on the enemy positions between the Toora and Arsa valley and one of our aeroplanes compelled an enemy machine to descend precipitately at the Kostanievica height."

TURKEY

"On May 19 eight enemy airmen appeared over the Dardanelles and dropped seventy bombs without effect," the Turkish War Office reports. "One of our batteries twice opened an effective fire on them. The same night seaplanes, which were pursuing enemy airmen, flew over Imbros and dropped nine bombs on the aeroplane sheds of the enemy, with good effect.

"In reply to the shelling of El-Arish (an Egyptian town near the boundary of Palestine which recently was bombarded by the British) one of our aerial squadrons on the night of May 19-20 attacked Port Said, dropping numerous bombs on vessels anchored in the harbor and on military establishments in the town. We observed great conflagrations. Our airmen returned safely notwithstanding the heavy fire of the enemy's batteries."

SPAIN

There is a civilian Aviation School in Getafe, and two Military Schools, one in Cuatro-Vientos (Madrid), and the other in Guadalajara; further than this, there has recently been inaugurated a School for Marine Aviation in Santurce, which has had a grant of 100,000 pesetas from the Spanish Government. In Barcelona there has also been inaugurated a civilian Aviation School, which has for its first instructor Sr. Hedilla, a Spanish aviator.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
47 Churchill St., Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The "Swallow" Model

In constructing the model shown in the accompanying drawing it is important that the drawing be followed carefully, that all the parts be cut and completed to the size set forth on the drawing and that the materials mentioned on the drawing be used and no others substituted. If these instructions are carefully followed there is no reason why the model will not fly at least 1,000 feet and over, and 60 seconds in duration.

The frame consists of two side members placed in the form of a triangle; these side members are made of spruce, white pine, poplar, or any other light, strong and flexible wood, and are cut and sandpapered to the size indicated at the top of the drawing marked "section of frame." At one end the sticks are beveled off so that when placed together they form the apex or point of the triangle. A piece of thin steel wire is bound with silk thread over the point and glued and the ends of the wire are bent into hooks as shown. The other ends of the frame members are slotted so that the rear brace, or "propeller bar," as it is termed, can slip into these slots and be bound therein with silk thread and glued. The frame is braced midway between its ends by the "X" bracing, of ⅛" square bamboo rounded. At the ends of the propeller bar (which is of bamboo, ¼" wide at the center, tapering to 3/16" wide at its ends) are secured the propeller bearings, which are formed of brass tubing of 1/32" bore. These bearings are soldered to strips of thin brass, which are bent over the ends of the "propeller bar" and bound with silk thread therein and glued.

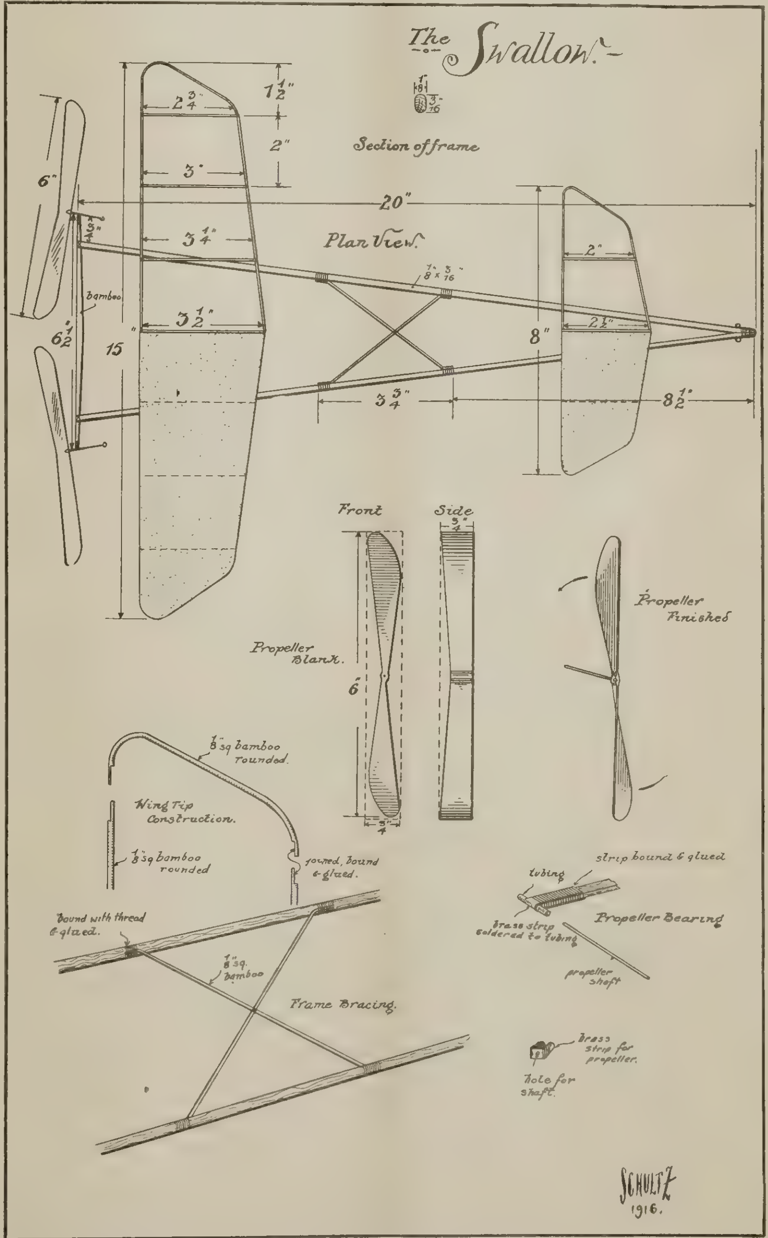
The propeller blank, which measures as indicated in the drawing, is of white pine, and the finished propellers, which are cut to turn in opposite directions, are cut very thin (about 1/32"), as lightness is very essential in this model.

Before cutting the propellers the blanks should be drilled for the reception of the propeller shaft, which is of 1/32" steel wire to fit the interior of the bearings and freely rotate therein without undue looseness. After the propellers have been cut and given a thin coat of shellac the shafts are passed through these holes and their outer ends clenched over so that the shafts cannot turn without the propellers turning with them. Brass strips are bent about the propeller hubs, against which the outer ends of the bearings bear. Each propeller is driven by 6 strands of ⅛" flat rubber. The planes are constructed entirely of bamboo ⅛" square and all joints made by binding with silk thread and gluing.

Both planes should be covered with gold beater's skin (sometimes termed "Zephyr skin"), which is glued on the upper side of the plane and then held over a steaming kettle, after which the surface is lightly rubbed with a soft cloth moistened with ambroid varnish.

The Aero Science Club of America

The mechanically-driven model contest of the National Model Aeroplane Competition, to be held during the latter part of June, promises to be one of exceptional interest. Members of the Club are working hard on motors of new designs with the hopes of surpassing the 50-second duration mark. Mr. W. H. Hodgins has been working on a model gasoline motor, which he believes will give a good account of itself, and Messrs. McMahon and Schober, who have for a long time been experimenting on compressed air motors, also hope to bring forth world record models. The date this contest will take place will appear in the next issue.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Our Own Hashimura Togo

Editor of that Dear Aerial Age:

Having read of my exploits as aviator in Aerial Age, Hon Japanese minister of aviationing sends following telegraph (cost 666666 yen) "Hon Japanese Goverment request your immediate intendance of at Royal School of Fly. You are request to depart with all hasteness for Tokio on next Cattle Boat."

Although my arm are still in slings from result of high fall in California where I was bomb dropping device (little delayed as to cause unfortunate drop through miles of atmosphere) I say "shall direct descent of Hon Japanese Emperors, be cowardice? Shall well learned Japanese student take Bryanish means of avoiding axident? No, this are not the truth!"

Having been deport from California on charge of attempt murder on Aeroplane pirate I still have money to extent of $13.76, by means of which I approach Hon Captain Argintine Cattle Schooner which are soon leave for land of Sun. "How much are damages for fare to Japanese Landings" (from me).

"How much you have?" He ask this in voice of hotel waiter only more human.

"To extent of $13.76," I deplore.

"Hon U. S. Government say two cence per milage," he sob, "13.76 take you not far distance; are you expert swim rest of way?"

After long argument we arrive on terms. As following: My $13.76 are to pay partly for seasick trip. Rest, I work. I am share room with prize cattle and some days eat. I am pay on arrive.

Third day on ocean Hon sailor say "Togo how about small bones rolling game?" "I am not small dog," I return. "Not so" (from him) "this are great American game of gamble," with intense luck you make train fare to aviationing grounds." I agree.

First he take small square articles with black dots from pocket.

After long shake like bartender with mix drink he roll articles on floor with loud snap of fingers. "Come seven for fifty cents" he negotiates. Small cubish articles add up to seven, and I am then in possession of $13.26 (fifty cence departing with roll of seven). In very short time my money are defeated. I am then without currency when Captain ask for remittle on boat ride. "Not so" I correspond, "Hon American sailor possess all. "What I am receive for transportioning you across ocean?" (He say this). "You receive deep thanks," I parley. What next happen I do not possess remembrance. I am now in hospital for cripples in London, expecting to leave soon for Japan. Although possessing injury to extent of six ribs useless for breathing having come across ocean for no expense, I feel very cheap.

Hoping you are the same,

Hashimura Togo.

(Forgive me Wallace Irwin.)

Very Fly

To a news stand came a new patron who seemed to have but hazy ideas of just what he wanted. He looked at stationery and he looked at pencils and he looked at playing cards. He asked the price of this magazine and that, and looked over postcards and the books. The young woman who was in charge of the counter became somewhat wearied answering questions without making a sale. At last the prospective customer asked:

"Have you any fly paper?"

"Yes, sir," was the prompt reply. "We have the Aeroplane Journal and the Aviators' Gazette."

Originality in aeroplanes is an expensive luxury.—*Stevenson MacGordon.*

Reporter (interviewing famous aviator): "And in what state were you born, Mr. Fligh?"

Aviator (tired of being questioned): "In a state of ignorance, young man."

Reporter (absent-mindedly): "Ah, yes, to be sure—and how long have you lived there?"

"What is that crowd doing around that aviator?"

"Oh, nothing but vulgar curiosity, I suppose. Let's go over."

Nobranes: "I see that Jim has left the aeronautical business and is now a millionaire."

Numscull: "How did he do it?"

Nobranes: "Grafted doughnuts on rubber-plants, and now owns the largest automobile-tire plant in existence."

1830.

"LOW BRIDGE!"

1916.

"LOW AEROPLANE!"

AERIAL AGE
WEEKLY

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House of Representatives Votes $3,500,000—Senate Expected to Double This Sum

ON May 31st, while the Naval Appropriation was being debated in the House of Representatives, a group of Congressmen paid another visit to the flying boat and asked a few more questions to the men in attendance, who promptly and cheerfully supplied the information. The Congressmen went back—and an hour later, on motion of Congressman Roberts, of Massachusetts, the House voted to increase the Naval appropriation for aeronautics from $2,000,000 to $3,500,000. The amendment was adopted by a vote of 129 against 103.

Whereas, the Navy has at present, as shown by the statement of Chairman Padgett, of the House Naval Committee, only 16 aeroplanes, no kite balloons, and only one small dirigible, everything has to be provided, and the total cost of the organization as estimated by Captain Mark L. Bristol, would be $13,600,000. This amount, Captain Bristol figured, would provide the navy with 82 aeroplanes, 5 dirigibles, 41 kite balloons, and two aircraft ships costing $2,000,000 each.

The lessons of the North Sea battle may convince the Senate of the wisdom of allowing the $13,600,000 to carry out Captain Bristol's plans. It cannot do less than to double the amount allowed by the House of Representatives.

U. S. Navy to Have Substantial Air Service at Last—Aero Club of America's Efforts Result in Appropriation of $3,500,000—Senate May Double it and Provide for Construction of Zeppelins

THE United States Navy is, at last, to have a Substantial air service. Thanks to the Aero Club of America, the National Aero Coast Patrol, of which Rear Admiral Peary is chairman, and the New York *World*, which combined efforts to bring to the attention of Congress the facts regarding the need of aircraft and the possibilities of the organization of a substantial naval air service, Congress voted $3,500,000 for aeronautics.

Sending a large 160 h.p. Curtiss flying boat to Washington, assembling it at night at the entrance of Congress Hall, so that Congressmen could not help seeing it, was a masterstroke. Congressmen and Senators, who are pressed with a tremendous amount of work and have not the time to seek the information they want on different subjects, were delighted over this demonstration, and made use of the facilities afforded. First singly, then with their families, then in groups, they came to inspect the flying boat and asked questions which the two men in attendance answered most ably.

Coming, as it did, soon after the flight of Messrs. Alan R. Hawley and Victor Carlstrom from New York to Washington, and the delivery by air of the New York World, the exhibition of the flying boat was thoroughly appreciated.

Official Washington learned long ago that the gentlemen behind the Aero Club's activities are patriotic, public-spirited men of unquestionable character who have the welfare of this country at heart. The Club, by training forty officers of the National Guard of different states in aviation and supplying aeroplanes for a number of states, has really done the Government's work, and no one appreciates that more than Congressmen and Senators.

Therefore, the Congressmen and Senators were in a receptive mood for the information which they sought and obtained.

Battleplane Attracts Official Washington—Shipped to New Mexico—Raymund V. Morris Will Fly It

SECRETARIES McAdoo, Lane and Daniels, General Miles, Jerry South, clerk of the House of Representatives, a sprinkling of Congressmen and Senators, Assistant Secretary of War Ingraham, aviation enthusiasts, and hundreds of citizens went to the Speedway polo grounds on May 25-26-27 to see the giant Curtiss military tractor J. N. 8 which Victor Carlstrom drove from New York to Washington on May 25th, making 237 miles in 184 minutes, according to the revised official figures.

It was a case of Mahomet—or a collection of Mahomets—going to the mountain, as it had been announced by the National Aerial Coast Patrol Commission that the big flier would be towed from the polo grounds to the White Lot, for the convenience of the high officials who had promised to inspect it.

But when the machine was taken on the Speedway by Captain Ralph Taylor, of the Connecticut National Guard, the officer in charge, it was found to be too large for safe transportation, and he decided not to fly it himself to the White Lot. The wings spread 54 feet over all and they nipped the branches of the trees on both sides of the road. So the machine was towed back to the polo grounds.

In spite of the change of program and the inconvenience entailed, the three cabinet officers and the others mentioned rode the greater distance and had the mechanism explained fully by Captain Taylor and Lieutenant E. W. Bagnell, an aviator in the Nebraska National Guard.

Secretary Daniels not only made a thorough inspection of the big flier which demonstrated so clearly to official Washington how easily hostile aeroplanes carrying machine guns and bombs could attack the capital of the nation, but he put one over on his own account by making the inspection and getting away before being recognized by Lieutenant Bagnell, who was in charge at the time. Speaking of the visit Secretary Daniels said:

"Yes, Mrs. Daniels and I and a party of friends visited the big tractor, and I was impressed by its evident strength, power and apparent speed capacity.

"The young officer in charge was very courteous, even though he did not recognize us, and he explained the workings of the machine fully."

The following morning several members of the military and naval committees of the House and Senate inspected the machine, and then Captain Taylor and Lieutenant Bagnell crated it and shipped it to the New Mexican National Guard, the gift of the Aero Club of America, to be used for patrol duty in Mexico.

Raymund V. Morris, the expert pilot who has been in charge of the Curtiss school at San Diego has gone to New Mexico and will take charge of the battleplane.

Congress Allowed as Much for Aeros as Asked by Secretary Baker

THE letter of the Aero Club of America sent to President Wilson, Secretaries Baker and Daniels and all members of Congress, protesting that the appropriation for aeronautical preparedness in the Army Appropriation Bill is inadequate, has elicited a reply, received by Alan R. Hawley, president of the Aero Club, from Representative Julius R. Kahn, member of the Committee on Military Affairs. The communication in part reads:

"I find that Secretary Baker recommended to the commit-

America Must be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

tee the expenditure of $1,222,100 for the Aviation Section of the Signal Corps for the year 1917. The committee allowed the entire amount asked for this purpose. If that amount is insufficient the fault lies with the department and not with the Committee on Military Affairs.

"The Secretary said it was the intention of the department to buy thirty-two machines this year. Personally, I feel that if the department will recommend an appropriation for an additional number, the committee would be willing to appropriate the sum needed. Of course, in all these matters the committee is guided largely by the estimates submitted by the department. It is doubtful whether the Army Appropriation Bill will pass the House and Senate before the opening of the new fiscal year. At the rate we are now going it will probably be about the middle of July before the bill will go to the President for his signature. The second session of the present Congress will meet on the first Monday in December next. If the department at that time will recommend additional amounts for aviation, I am convinced that the item can be included in the appropriation bill for the fiscal year 1918, with a proviso that the same be made immediately available.

"While Congress is responsible for many sins of omission and commission, you can readily see that when the head of the department makes a recommendation for a specific amount the committees of Congress will naturally rely on the testimony of the head of the department."

The Aero Club advocates an appropriation of $5,000,000 for the Army, and $4,000,000 for Militia aeronautics.

W. J. Bryan Did NOT Raise $2500 for an Aeroplane for the Nebraska Militia

COLONEL WILLIAM JENNINGS BRYAN was invited by the Aero Club of America May 12, 1916, to donate or assist in raising $2,500 to add to the $5,000 being raised by the club to provide an aeroplane for the National Guard of Nebraska, his State. An appeal recently received from Adjutant General P. L. Hall, commanding officer of the Nebraska National Guard, asked that the Aero Club assist him in obtaining an aeroplane.

Alan R. Hawley, president of the Aero Club, wired Colonel Bryan, acquainting him with conditions and saying:

"Adjutant-General Hall, of your State, like the heads of the Militia of other States, applied to the War Department for aeroplanes and for training officers in aviation, but was told that the War Department had no funds for this purpose. The estimates for aeronautics submitted to Congress by Secretary Baker show that the administration does not aim to provide more than a fraction of the number of aeroplanes which the Army needs. No provision whatever is made for Militia aeronautics. The Aero Club of America, with funds subscribed by patriotic people, has been able to pay the expenses of sending two officers of the Nebraska National Guard to train at the Curtiss Aviation School, which trained them free of charge. We are now willing to allow $5,000 immediately toward the $7,500 needed to buy a military scouting biplane, and beg to invite you to either contribute the balance or raise it through the *Commoner*. We assure you that this $2,500 cannot be better spent. It is for the protection of American lives and American property. Kindly advise whether you wish to contribute this sum yourself or prefer to raise it through the *Commoner*."

Colonel Bryan has not yet replied. Just why it is not known, but the accompanying remarks from different newspapers afford a selection of possible reasons:

The Pittsburgh *Sun* says:

"The Aero Club of America has asked Mr. Bryan to help buy an aeroplane for the Nebraska Militia. The Chautauqua season hasn't opened, and the winter season was not good, consequently the invitation will not likely be accepted."

The New Orleans *Times-Picayune*:

"The Aero Club of America has asked Mr. Bryan to donate, or assist in raising, $2,500 toward the purchase of a $7,500 aeroplane for the Nebraska National Guard. The request may provoke Mr. Bryan to demonstrate how easy it is to 'go up in the air' without an aeroplane."

The Albany (N. Y.) *Argus*:

"The Aero Club of America has asked Mr. Bryan to contribute $2,500 to a fund for the purchase of a Military aeroplane for Nebraska. Don't know what W. J. B. said when he received the request, but can imagine that his thoughts were unfit for publication."

The Dayton Evening *Herald*:

"The Aero Club of America has written a letter to William Jennings Bryan, asking indirectly for a donation of $2,500 toward the cost of an aeroplane for Nebraska. The letter states that the War Department has no funds for the purpose of equipping a plane squadron, and the club stands ready to contribute $5,000 of the needed $7,500 if the Peerless One will furnish the balance either by personal donation or through a fund to be raised by his publication.

"The club asks him to 'kindly advise whether you wish to contribute this sum yourself or prefer to raise it through the *Commoner*.' Now just watch the flutter in the peace dove cote."

The Salt Lake City (Utah) *Herald-Republican*:

"Mr. Bryan will probably compromise with the Aero Club of America, which has asked him to donate $2,500 to buy an aeroplane for the Nebraska National Guard, by offering to furnish the air if the club will furnish the plane."

Congress Applauds Aero Club and New York "World"

During the debate on the Naval Bill in the House on May 27, Representative Lieb, of Indiana, read a letter from Alan R. Hawley, President of the Aero Club of America, telling of the achievement of the *World* in being the first newspaper to reach the national capital in an aeroplane. Mr. Hawley enclosed a copy of the *World* to the Indiana member.

At the conclusion of the reading of the communication there was a burst of applause on both sides of the House, evincing the appreciation of Republicans and Democrats at the master stroke of mail delivery accomplished by "The World."

The letter from Mr. Hawley, which will be inserted in the Congressional Record, is as follows:

"My Dear Mr. Lieb—Under separate cover there is being sent to you a copy of the special edition of the New York *World*, which was delivered to Washington by aeroplane. Being the first metropolitan newspaper to be delivered by air route to the national capital, this copy of the *World* will have historical value, and you may wish to keep it.

"You will notice in this number an appeal to Congress to train 2,000 militiamen, coast guardsmen and mail carriers, so as to form a reserve of trained aviators who, while being employed daily for peaceful purposes, will be available to meet any emergency.

"While the special edition of the *World* was being printed, a cablegram was received by the fifteen Canadian aviation students being trained at Newport News, Va., from Earl Kitchener, the British War Minister, declaring that 'one aviator is worth an army corps.'

"This proves that we were modest in our estimate that a trained aviator is worth one thousand soldiers in the Mexican campaign. Had we had one hundred aviators at the Mexican border, the history of the Mexican trouble would undoubtedly read quite differently.

"We are glad to say that the aeroplane which carried these copies of the New York *World* to Washington was the Curtiss battleplane bought by the Aero Club of America with funds subscribed to the National Aeroplane Fund. From Washington it will be sent now to the New Mexico National Guard for service on the Mexican border.

"Page 3, of this letterhead, gives a brief résumé of some of the results obtained by the National Aeroplane Fund. Since this was printed a number of other States have taken up aviation, making close to forty States that have taken steps to organize an aviation section in the Militia. A dozen States are appealing to the Aero Club of America for aeroplanes, and for means with which to pay for the training of Militia officers in aviation. Assistance is given them as fast as the funds received permit.

"There is a limited number of the first 'aeroplane edition' of the New York *World* on hand, and if you or any of your friends would like an extra copy for historical interest, we would be very glad to send you one.

"Thanking you for your co-operation and support of this important movement, I remain, very sincerely yours,

"ALAN R. HAWLEY,

"President, Aero Club of America."

A Roosevelt Administration, in 1907, at a time when aeroplanes were not yet publicly known to be capable of flight, with remarkable foresight and progressiveness, drew the specifications for an aeroplane, and gave the United States Army an aeroplane—two years before any other country took a similar step.

One who looks for a solution to the problem of organizing the air service needed for national defense finds that the only hope lies in another Roosevelt Administration.

THE NEWS OF THE WEEK

North Island to be Permanent School?

North Island, in San Diego Bay, has been definitely proposed as the permanent site of the Army Aviation School, and negotiations, it is expected, will be brought to a successful conclusion for the transfer of the property to the Government.

The price at which the island will be offered is secret, but it was said recently on good authority that it was a fair figure.

Colonel William A. Glassford, commandant of the Aviation School, said that several suggested sites had been examined, but none compared with North Island in all-around desirability.

Application for Aero Mail Service

The first application made for the establishment of an aeroplane experimental mail delivery service, provided for in the Postoffice Appropriation Bill, recently passed, has been filed by Congressman James J. Britt, of North Carolina, with Postmaster General Burleson. Mr. Britt asked that an aeroplane mail route be installed between Asheville and Chimney Rock, a well-populated mountain resort about 20 miles by road from Asheville. The postoffice bill passed some time ago made provision for several aeroplane routes. to be conducted as an experiment.

Niles Makes Record Climb in New M. F. P. Steel Warplane

Charles F. Niles, the renowned loop-the-loop flier, who has just returned from a tour of Japan, tried out the new M. F. P. steel warplane at Garden City, L. I., on June 2.

Although he had not been in a machine for some time and had never handled the Dep control, Niles showed his confidence in the new machine by ascending 3,500 feet in it at the first trial in record time in the teeth of a 35-mile-an-hour wind.

In spite of the strong wind and the pilot's unfamiliarity with the controls, the machine flew so steady there was no perceptible swaying in the wind, and the strong gusts had very little effect, either on its speed or climbing capabilities.

Without any effort to force the machine, and with a three hours' load of fuel aboard, Niles climbed the machine 3,500 feet in just four minutes, which would indicate that if pushed and with a fair load aboard the craft could easily climb at the rate of 1,000 feet a minute.

During the coming week extended trials, both for speed and climbing, will be made by Niles.

Mr. Phipps advises that he is now bringing out two new machines of improved design and construction, using the steel construction, and that the first of these, a new speed seaplane, will be ready for trials in about three weeks. This machine is designed for a speed of 75 miles per hour, and will be equipped with a 130 horsepower Hall-Scott. The third machine under way is a special speed scout, designed to attain 130 miles per hour, which will be fitted with a special 12-cylinder motor developed for it.

Rodman Wanamaker to Have Curtiss Rights in the East

The following is the closing paragraph of Mr. Rodman Wanamaker's letter of April 1 to Mr. Alan R. Hawley, president of the Aero Club of America, announcing that he had contracted for a new "America" to attempt the trans-Atlantic flight:

> "In connection with the above, still believe that the first crossing of the Atlantic Ocean will only mark an epoch in aerial navigation, and this faith in its future is another important reason for the existence of the "America" Trans-oceanic Company. I hope to see the day when this Company will be running aerial liners regularly across the Atlantic and other oceans."

The closing sentence of the above paragraph suggested that while Mr. Wanamaker was just as much interested in crossing the Atlantic as ever, he also had other plans on his mind in regard to the development of aviation and aerial navigation. The ultimate development of these plans will apparently be stupendous, but we are now able to announce the next definite step of the America Trans-Oceanic Company in carrying them out.

This company has just completed a contract with the Cur-

The Curtiss Flying boat which was on exhibition for a week in Washington in a campaign to familiarize Congressmen and Senators with our aerial needs. Left to right in the picture are: Congressman Curry, of California. Ripley Bowman, Prof. Frankenfield, Admiral Robert E. Peary, Smith and J. Fred. Kelly.

tiss Aeroplane Company for the agency for a number of years for their entire line of flying boats, aeroplanes, motors, etc., for Greater New York and vicinity. They have leased offices in the Foster building, Nos. 278-280 Madison avenue, corner Fortieth street, just one block south of the Aero Club, and are now looking for a suitable site on the water in the vicinity of New York. As soon as one has been decided on, hangars, repair shop, etc., will be erected, and they will not only demonstrate their new flying boats, but will conduct a school and carry passengers. The boats have already been ordered, and we expect to have our plans in operation in a few weeks.

Mr. William D. Gash, contract manager of the Wanamaker stores, who has had charge of all the preparations for the trans-Atlantic flight for Mr. Wanamaker, has been elected vice-president and general manager of the company, and will have general supervision of the agency, as well as the trans-Atlantic flight.

The details of the New York agency, flying field, school, etc., however, will be handled by Mr. Stuart Macdonald, who has been made assistant manager of the company, and will devote his entire time to it.

Mr. Macdonald spent a number of years in the automobile business with the Pierce-Arrow and Chalmers companies. A little more than a year ago he purchased a Curtiss power plant and constructed a flying boat himself, which he used in Chicago last summer. He placed this boat at the service of the Naval Militia, and he and Mr. A. M. Andrews, of Chicago, were the first volunteer Naval aviators in the country. His boat was used in connection with the gunboat "Island of Luzon" in scouting, bomb-dropping, etc., and excited a great deal of favorable comment from the press and public in Chicago during May and June of last year. The boat was later used by Mr. Macdonald in passenger carrying on Lake Michigan.

During his visit to the Curtiss factory, he met Mr. Curtiss, which led to his connection with the Curtiss Company in the capacity of manager of motor sales, which position he held until June 1 when he resigned to accept the position with the America Trans-Oceanic Company.

"Mr. Wanamaker's faith in the future of aerial navigation," Mr. Gish said, "led him to establish the school. He believes that the time is near at hand when aeroplanes will be almost as numerous as automobiles, and he planned the trans-Atlantic flight to show the world that the aeroplane is a commercial vehicle as well as a deadly engine of war. It was only the war that prevented the carrying out of his original plans of more than two years ago, when Flight Commander Porte was to have tried the transatlantic flight in the original 'America.'

"The plans for this present attempt are coming along as well as could be expected. The first of the six 200-horsepower motors that will be used to drive the huge triplane across the ocean was recently tested, and proved to be even better than we had hoped.

"There are a number of young men here in this city who would like to learn to fly. The greater number are sportsmen who prefer the water boat, and it is for their convenience that the new school was planned. Of course there are women also who want to fly, and especial provision will be made for them."

The Norma Company of America to Erect a New Factory

The Norma Company of America, manufacturers of "Norma" high-precision, anti-friction bearings, announces through its president, Mr. W. M. Nones, the purchase of a ten-acre factory site at Elmhurst, on the outskirts of Long Island City. The property fronts on Queens boulevard and has a depth of about a thousand feet, abutting in the rear upon the main line of the Long Island Railroad, from which a siding will be built directly into the plant.

The company has in five years become prominently identified with the automobile industry of the country. Beginning as importers of bearings, the merit of its product gained quick recognition among the manufacturers of ball-bearing automobile accessories. Today "Norma" bearings are used in many of the high-grade magnetos, lighting generators and starting motors made in America. The steadily increasing demand for these high-speed, silent-running bearings—soon outstripping import resources—forced the company into the manufacturing field and has necessitated repeated enlargements to its factory facilities.

The latest move is made in response to an imperative demand for a still larger immediate output, with facilities for extension with the future growth of the business.

The plans now under way provide for a four-story building, 70 x 350 feet, to be erected immediately in reinforced concrete. Every modern improvement will be embodied, looking toward the maximum of production efficiency. The architects for the new factory are Francisco & Jacobus, of New York City. The location was determined upon, not alone for the unsurpassed shipping facilities afforded, but also for its ready access to the labor markets and home sections grouped around Long Island City—surface and subway lines running close to the property, giving quick communication with neighboring Long Island towns as well as with Manhattan Island via the Queensboro Bridge.

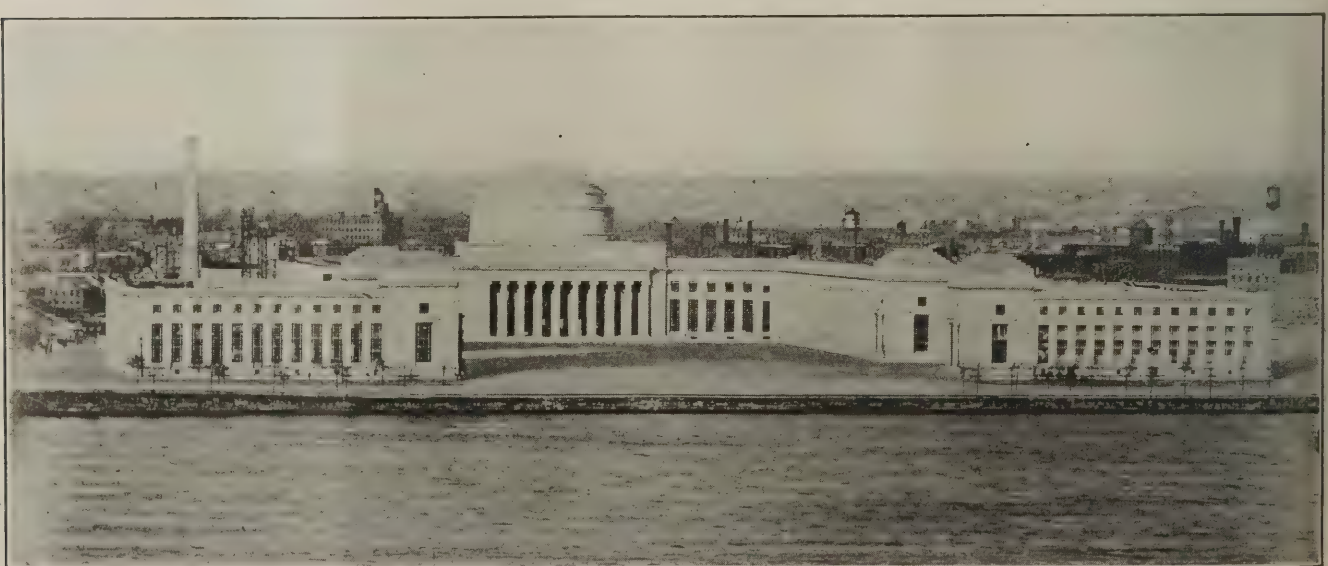
Shifts Ordered in the Army Aviation Service

Captain Cowan, until recently head of the Army Aviation School at San Diego, has been ordered relieved from duty there October 1, and to sail October 5 for the Philippines. Other shifts in the Aviation Service are:

Captain Clark and First Lieutenant Milling ordered on duty at Washington; First Lieutenant Dargue, until recently flying in Mexico, and First Lieutenant Jones, on special duty at Washington, ordered to San Diego School; Second Lieutenants Atkinson, Brookes, Martin and Spatz, aviation students, from the San Diego School to duty with the First Aerial Squadron in Mexico.

Court Awards Priority Over Curtiss to Albert S. Janin

A dispatch from Washington on June 1 announced that priority of invention of the hydroaeroplane was awarded by the District Supreme Court to Albert S. Janin against Glenn H. Curtiss. A decision of the Commissioner of Patents was reversed on the ground that Janin had established a date of conception three years ahead of Curtiss. The court held, however, that its decision would not take from Curtiss the patentable "subject matter he may have originated."



The magnificent new buildings of the Massachusetts Institute of Technology which will be formally dedicated on June 12th. The aeronautical laboratory will be housed in magnificent quarters in the building towards the left in the illustration.

Tillman on Navy Appropriation

Senator Tillman, chairman of the Senate Naval Committee, charges that the taxpayers are not getting their "money's worth" in the army and navy expenditures, and pointed out the inefficiency of the army aviation corps and the deficiency of the navy in submarines to support his statement.

"American inventors first conquered the air and taught men to fly," he said, "but notwithstanding that we were the pioneers and discoverers of aerial navigation, every American must have blushed with mortification at the unprepared condition of our army and the worthless character of our flying machines as shown by the punitive expedition into Mexico. It was anything but creditable to American genius, progressiveness and business ability.

"The appropriations for aviation have not been at all lavish and perhaps they were inadequate, but I feel sure that an honest and earnest supervision and inspection of machines before they were paid for would have given us better results, and there are entirely too many excuses—and lame excuses—to satisfy the people. There is incompetence or rottenness somewhere and it ought to be ferreted out and punished."

Benjamin Thomas Weds

Benjamin Douglas Thomas, Vice-President of the Thomas Brothers Aeroplane Company, Ithaca, was married on May 27 to Miss Georgina Andrews at the Church of St. Andrew, Fifth Avenue and One Hundred and Twenty-eighth Street. Mr. Thomas and his bride are of English birth. He is from Southampton, while Miss Andrews is from Barnet.

The couple left for Pensacola, Fla., where Mr. Thomas is to superintend trials of the aeroplanes which are being built by his company for the United States Navy.

Burgess News

Extensive trials were made on Saturday, May 20, of the new Burgess-Dunne seaplane built for the Second Battalion of the New York Naval Militia. Mr. Vincent Astor, as has already been stated in these columns, was instrumental in securing this machine from the Burgess Co. at Marbelhead, following his success with the seaplane constructed for himself last summer. Mr. Astor came to Marblehead on his yacht, the "Noma," accompanied by four other members of the Second Battalion, of which he himself is an officer. Accompanying him were Lieutenant S. S. Pierce, Ensigns Blackburn and Poor and Petty Officer Johnson. Flights in the new machine were made on Saturday, Sunday and Monday, under the observation of the New York officers, who expressed themselves as well pleased with the performances of the machine. On Monday the New York party returned, having accepted the seaplane, which was put through further trials by Aviator Clifford L. Webster of the Burgess Co. and the machine was then shipped to New York on Mr. Astor's yacht on Saturday, May 27, in order to expedite the delivery and consequently facilitate the work of training the New York Militia officers. The machine is regarded as one of the finest of the Dunne type ever turned out by the company. It is streamlined throughout and a new feature which has been introduced greatly cuts down the head resistance. This consists in mounting the radiator in the rear end of the fuselage behind the motor, making it absolutely negligible so far as forward resistance through the air is concerned. In this position, which follows a recent practice of the Curtiss Aeroplane and Motor Co., the cooling of the motor appears to be perfect and a problem which has long puzzled aeroplane constructors with regard to the pusher type of machine has been solved.

Meanwhile, work is rapidly progressing on the second machine under construction by the Burgess Co. for the same Militia organization and early in the summer the New York Militia will be far ahead of that of any other State in aviation development.

Meanwhile, tests have been continued with the Navy seaplane under the direction of Lieutenant George Murray, U. S. N., which have proven very satisfactory. With full load exceeding 700 pounds the machine showed a speed of 77.75 miles an hour and maintained a rate of climb of 278 feet a minute for nine minutes.

One of the most notable features of the Boston Preparedness demonstration on May 27 was a flight over the heart of the city by a Burgess seaplane. The machine was driven by Aviator Clifford L. Webster, with Godfrey L. Cabot as the passenger. The craft used was the "Lark," the machine built by the Burgess Co. at Marblehead, Mass., for Mr. Cabot. The two were in the air for a period of nearly one hour.

They left Marblehead at 3:17 in the afternoon and flew across the bay and over Boston Harbor to the mouth of the Charles River, the course of which was followed up to a point beyond the city. Circling there, the seaplane was driven back along nearly the same course and was seen by hundreds of thousands of spectators who were watching the big parade.

Mr. Cabot, who is very greatly interested in stimulating interest for an aerial defence, planned the flight with this point in mind, and during the course of the flight dropped over the city thousands of cards calling attention to America's lack of preparedness in this respect. It is safe to say that no event in Massachusetts has ever had such a notable effect in awakening the general public to an active interest in military aviation.

The return trip to Marblehead was made safely and the aeroplane landed shortly after four o'clock, having covered about 50 miles.

Two Burgess machines of the Dunne type are now in active service in the Second Battalion, New York Naval Militia, having been shipped from Marblehead on May 27, and set up for training purposes off Vincent Astor's estate at Rhinebeck on the Hudson. Aviator Webster was sent down by the Burgess Co. to superintend the flying and has been busily engaged during the past two weeks, instructing officers of the Battalion. A third Burgess machine is soon to be shipped to the same organization, while a fourth is due to go down some time early in the summer. This will give the Second Battalion a total of four machines, far in excess of the aircraft available for any other Militia organization in the country, and not greatly exceeded, unfortunately, by the strength of the United States Navy during the past few months.

The Richardson tandem plane, twin motored, hydroaeroplane being tried near Washington, D. C. Two Robert motors are used. George A. Gray is the pilot.

THE AERIAL DERBY

ALREADY more than thirty machines have been offered by constructors to be entered in the race, initiated by the offering of the Pulitzer Trophy for an annual National Aerial Derby.

Responses received from all over the country by the Aero Club of America have shown that statesmen, educators, historians, military men and business men have recognized the true significance of the achievement realized when the "Aeroplane Edition" of the *World* was carried from New York to Washington in the early morning of Friday, May 26, without a stop and made the first aerial delivery at Washington of a metropolitan newspaper ever accomplished.

A new page in the history of journalism was opened when Victor Carlstrom, aviator, and Alan R. Hawley, president of the Aero Club of America, as honorary courier, landed in front of the Washington Monument. Already the famous edition of the *World* is coming to be known as "the paper which made history."

From all parts of the country requests have been received by the Aero Club of America for additional copies of the paper as souvenirs and as records to be placed in museums and public libraries. Unfortunately the edition has been exhausted. Letters have flowed into the office of the *World* indorsing the preparedness plan proposed by the *World* in the edition and lauding the paper for having been the first to adopt a new method of transportation for commercial purposes.

The Italian Royal Flying Corps in New York, which is closely connected with the Government at Rome, was one of the first to acknowledge receipt of its copy of the Aeroplane Edition, and in the reply requested that an extra copy should be sent to the Italian Government.

The great university libraries of the country have made appeals for copies to file for reference in relation to the flight. President H. B. Hutchins, of the University of Michigan, wrote after he had received his copy:

"I beg to acknowledge yours of May 25, together with copies of the New York *World* referred to therein and to thank you for writing and sending the copies. I am depositing the letter and the copies in the General Library of the university."

Similar requests have been made by the presidents of Bates College in Maine and the Georgia School of Technology.

Governor Frank B. Willis, of Ohio, who as a member of Congress, was very active in securing favorable legislation for aviation purposes, wrote:

Event of Exceeding Interest

"This is an event which it seems to me should be of exceeding interest to the country. Personally I have some interest in this achievement because, as a member of Congress, it was my privilege to take a very active part in the procuring of additional appropriations for the Aviation Corps. I am much interested in the subject and am more convinced than ever of its great importance to the country."

State officials in many parts of the country have shown the same interest in the flight as Governor Willis. From the executive offices of the Governor of Oklahoma hope was expressed that it would soon be possible to make a continuous flight from New York City to the capital of Oklahoma.

United States Military officers were loud in their praises of the flight. Rear Admiral W. S. Benson from his office in the Navy Department at Washington wrote upon receiving copies of the *World* Aeroplane Edition:

"I am keeping one of the copies myself and have given the other to one of the officers attached to my office. He wishes to keep it as a souvenir, for he feels as I do that this flight will have an important place in history."

The Smithsonian Institution at Washington, acknowledging receipt of its copy, said:

"You are an excellent mail carrier, for the paper arrived in record time. Please accept thanks for it. The number will be preserved in the aeronautical library, which you know is here at the Smithsonian Institution."

WIRELESS EXPERIMENTS WITH KITES

TO solve one of the problems met in the expedition of the United States Army into Mexico, that of communication between the base of operations and the advance force, experiments which proved that kites can be used successfully in this kind of work have been made by Lieut. Henry C. Gawler, of the United States Radio Service, and a group of officers of the Massachusetts Volunteer Militia, who had become interested in the use of kites to support an antenna as recommended by Samuel F. Perkins. Mr. Perkins holds altitude records for man-carrying kites and international records in aeronautics.

With the present field radio equipment poles standing 40 feet high must be erected before communication can be established over a distance of 20 miles, and poles can be used as a target by hostile forces. A private exhibition with kites as the means of communication was recently given by Company A, of the Signal Corps, of the Massachusetts Volunteer Militia on Soldiers' Field, close to Harvard College, Cambridge.

The pack radio equipment was used for the experiments, having a power of less than one-quarter kilowatt, supplied by a hand generator—a typical field pack radio set. Such an equipment is carried on two pack mules in the field and would include a 40-foot mast, carried in sections; a third mule is provided for other accessories. The kites were in charge of Mr. Perkins and his assistants, and the radio apparatus was handled by Company A, Signal Corps of the Massachusetts Volunteer Militia.

Some time ago the United States Navy held tests of this method of supporting antennæ, using cable for the main kite string and kites of great lifting power. The tests were held at sea, a battleship towing the string of kites.

The object to be accomplished is to support the antenna in such a position that its electrical connection with the earth would not be changed, with every motion of the kites. This is possible by the plan of Mr. Perkins. He simply flies kites enought to support the weight of the antenna wire some distance back on the main kite line, controlling the train of kites. It is only necessary then to tie the antenna to the ground, and it becomes vertical, remaining in that position as long as the kite stay up.

FOREIGN NEWS

AUSTRIA

An aircraft raid on Bari, on the Italian Adriatic coast, during which various government establishments were successfully bombarded, is reported by the Austro-Hungarian Admiralty under date of May 25, as follows:

"A naval air squardon on the afternoon of May 24 dropped numerous bombs on the railroad station, post office, barracks and citadels of Bari. A good effect was observed in the midst of the flag bedecked town, where celebrations that were in progress were interfered with. The fire of the defensive batteries was without effect and all the aeroplanes returned undamaged."

An unofficial despatch from Rome on May 26 reported an air raid on Bari in which eighteen persons were killed and a score of others injured. The victims, it was declared, were mostly women and children.

FRANCE

On June 1 French air squadrons engaged in combat the group of aviators who came to bombard Bar-le-Duc and compelled a second group of enemy machines to disperse. A German machine was brought to the ground near Etain and in the course of this pursuit a Fokker machine, attacked by two French machines, came down near Bouconville.

Eugene Gilbert, one of the best known French aviators, who was interned in Switzerland last August, has escaped for the third time. It is understood he has reached Italy.

The following is the official report of France for June 1:

On June 1 groups of German aeroplanes threw several bombs on the open city of Bar-le-Duc. Eighteen of the civil population, of whom two were women and four children, were killed and twenty-five wounded, among these six women and eleven children.

An Aviatik attacked by one of our aeroplanes was compelled to land in our lines south of Bernecourt, in the region of Toul. The two enemy aviators were made prisoners.

The recent air raid over Bar-le-Duc by the Germans was in an endeavor to engage the American aviators with the French Army, according to a recent letter received from Sergeant Lufbery in Paris.

"They tried to get us when were in the Belfort section," he says, "and now they're on our trail again."

Headed by their French Captain, Sergeants. Bert Hall, Victor Chapman, Norman Prince and Elliot Cowdin darted aloft as soon as the invading squadron's approach was telephoned from the firing line. They opened fire directly over Bar-le-Duc, but the Germans outnumbered them more than two to one, and both the Captain and Prince were forced downward, one with a punctured gasoline tank, the other with his ammunition box blown off by explosive bullets.

Soon after Cowdin's machine gun choked, and he, too, descended. Hall and Chapman kept after the Germans until, reinforced by a French squadron from Toul, they were able to force them back into their own territory.

None of the Americans was injured, but the American ambulance section in the Bar-le-Duc sector was kept busy picking up the wounded, most of whom were civilian townsfolk.

Gen. Petain, in the cottage in which he has been living since the Verdun struggle began, doesn't have any of these luxuries. Twice a day or oftener they go to the aviation field nearby, get into their baby Nieuports—the finest "aeroplane of pursuit" in the French service—and slip off in a bunch toward Douaumont or Dead Man Hill.

Their duties are comparatively simple. They are to keep the German machines from crossing the French lines. Whenever and wherever they meet a Fokker or an aviatik they are expected to bring him down or force his to turn tail. If they can do this without sacrificing their own machine or lives so much the better, but it must be done.

They are the elite of the French aviation corps, for they drive the battle-planes which convoy and protect the bigger and more cumbersome craft employed for bomb dropping, regulating shell fire and photography.

GERMANY

An air raid by a German flying squadron on a Russian aeroplane station at Papenholm, on the island of Oesel, in the Gulf of Riga, is announced in a German official communication May 31.

"Thursday night a German air squadron again dropped bombs on a Russian aeroplane station at Pepenholm, on the island of Oesel. The squadron obtained lucky hits, mostly on the air station itself.

"In spite of a heavy fire directed against them all, our aeroplanes returned safely."

Two Zeppelins were reported lost in the naval engagement on May 31 by fishermen at Esbjerg, Denmark. The entire crew of one airship was said to have perished.

It will be remembered that in our issue of April 24, the following statement was made:

"The decisive action of this war will be in the air. When the German navy does show itself it will be accompanied by clouds of seaplanes and Zeppelins."

In the great naval engagement in the Black Sea, the Zeppelins were very effectively used. To quote from a report from Washington:

"The Zeppelins won the day for the Germans, it is believed here. It is thought that the German fleet emerged from its base knowing full well the location of the British battle cruiser squadron and exactly the task it had before it. The Zeppelins had preceded the German fleet and had spotted the enemy cruisers at a distance of probably fifty or one hundred miles in advance of the British dreadnought line.

"From their great height the Zeppelins had perfect observation of the British ships. They were in wireless communication with the German fleet. Continuing this communication, the Zeppelins, it is believed here, guided the German fleet out from its base and brought it under cover of the mist into immediate contact with the enemy before the British realized the force that was upon them."

Although the seaplanes were not directly concerned in the battle, it is thought that they kept a strict watch for the British fleet.

The German fleet, it is assumed, came from its base at Kiel through the Kaiser William Canal, putting to sea from Brunnsbuettel, the North Sea outlet of the waterway. Not many miles to the north lies the Isle of Sylt, the base of the German seaplanes, and possibly of Zeppelins. It was here that an engagement was fought between British and German cruisers and torpedo craft two months ago as the result of a British raid on the hangars.

One of the chief duties of the seaplanes on Sylt when they are not making raids on England is to "look out for the British fleet." It is likely that news of the approach of the British naval forces on Wednesday was sent home by these patrolling seaplanes, and that the Germans, seizing upon this chance, went out forthwith to make the test so long awaited by the world.

There are also evidences of Zeppelins having served the Germans as the "eyes of the fleet." A Copenhagen despatch on June 1 reported that a Zeppelin had been sighted over the Danish island of Fanoe in a damaged condition, flying over Denmark in the direction of Schleswig.

Along the same lines, the Manchester *Guardian* has the following to say:

"The movements and strength of the British squadrons had been reported to headquarters by the Zeppelins. The German fleet came out in greatly superior strength, and, still receiving Zeppelin reports as to the British movements, was able to take up an advantageous position before the British could be made aware of the approach."

The loss of forty-seven aeroplanes by the Allies during the month of May is reported in an official German statement issued June 5th.

According to the announcement, all but eleven of these were brought down by German airmen in aerial battles. The German loss during the month was sixteen.

The statement is as follows:

Aerial combats in May resulted very successfully for us. The enemy in aerial combats lost thirty-six aeroplanes. In addition nine were shot down from earth, and two landed involuntarily within our lines, making the total enemy losses forty-seven aeroplanes. We lost eleven in aerial combats and five which did not return to the German lines, a total of sixteen.

This total of sixteen is in contradiction of the British reports, which claim a total of twenty-one German and Austrian aeroplanes brought down. The French claim to have brought down thirty-four in the same period.

GREAT BRITAIN

A recent dispatch says that a Zeppelin, descending near Veles, on the Salonica Front, came in contact with some trees and was destroyed.

ITALY

On the 30th of May, Lieutenant Principe Maximilian Dentice de Frasso was killed in an aeroplane accident at Pisa. The Prince was a nephew of the Countess Carlo Dentice de Frasso, who, prior to her marriage, was Miss Georgina Wilde, of New York, niece of Rear Admiral Wilde, U. S. N.

JAPAN

The Japanese officials in charge of flying in the army have decided to train all army aviators in regard to searching from their aeroplanes for wounded soldiers on the ground. This service is being employed at present by the French aviators in the war. The aeroplanes will carry men with cameras who will photograph the different sections where dead and wounded lay. The plan has already been tried out and has been proved very successful.

The tractor biplane, so long in use in other countries is now being introduced in Japan. It has been designed for the use of the army aeroplane battalions. It is fitted with a 100 h.p. Daimler motor specially made in Japan. In appearance the new biplane resembles the Nieuport monoplane but it is claimed that it is much more strongly built and is more practical. More planes of the same type will be built.

On the first of May Art Smith, the American aviator, attended a banquet given in his honor by the Governor of the Aichi prefecture and the Mayor of Nagoya. The same afternoon he looped the loop several times at Nagoya at a height of 6,000 feet. On June 10th he leaves for Hawaii to make some flights and is due in San Francisco to fly on the Fourth of July.

RUSSIA

The Russian War Office on May 31st issued the following statement: "On the western front one of our aeroplanes brought down an Albatross over the enemy lines northwest of Baranovitch."

The Russian War Office on June 1st issued the following statement concerning the operations in Russia:

Six of our aeroplanes bombed Soly, to the northeast of Smorgon. Fourteen aeroplanes bombed Menevidichi station, on the Sarny-Kovel railroad. All returned safely.

In the Black Sea one of our submarines sank five sailing vessels and brought one into the port of Sebastopol.

TURKEY

The following statement was issued on May 31st by the Turkish authorities:

"Hostile aeroplanes on May 29th dropped thirty bombs on some quarters of the town of Smyrna, killing and wounding several people and damaging some houses."

On May 27th a hostile torpedo boat and aeroplanes attacked El Arisk. Seven persons were wounded by the bombs. Two of our aeroplanes attacked the vessel and the aeroplanes off El Arish, effectively dropping bombs and subjecting them to machine gun fire."

THE DEVELOPMENT OF ENGINES SUITABLE FOR AERONAUTIC SERVICE

Origin—Means Used, and Results

By CHARLES E. LUCKE

(*Continued from page* 305)

To the weight of the engine proper with all the parts that are permanent features built on or into it, such as the magnetos, oil pumps, air fans and water-circulating pumps, there must be added the weights of the other parts to get the weight of the power plant with empty tanks. These additional parts may be called the engine accessories. All such supplies, as fuel, lubricating oil and water needed for a given length of run, will add more weight, the amount of which depends partly on rate of consumption, partly on the general arrangement, but principally on the length of the run. The fuel weight to be carried per horsepower varies directly with the length of run and inversely as the thermal efficiency of the engine. The oil weight, while varying somewhat with the length of run, probably is not directly in proportion to it, and certainly has nothing to do with the thermal efficiency of the engine, but rather depends on such factors as quality of the oil, mode of its application, style of engine, bearing temperature and surface pressure and speed. Water in any properly proportioned jacket and radiator system should not be lost, and its weight may therefore be regarded as a fixed quantity entirely independent of the length of run and additive as is a piece of accessory equipment such as the radiator itself, though its weight value is, of course, a function of the aggregate internal volume of jackets, piping, pump and radiator.

It needs only a superficial examination of these weights of accessories and supplies compared to engine weights to see that for short runs, engine and accessory weights are more important than supply weights, but that for long runs the supply weights, especially those of fuel and lubricating oil, will become the controlling factors in plan weight, and the longer the run the greater the difference, and the more dependent does plant weight become on thermal efficiency and on efficiency of lubrication. For example, the data of the second German competition showed that the winning 100-horsepower Benz water-cooled engine, weighing 4.2 pounds per horsepower, consumed 0.472 pounds gasoline (thermal efficiency, 29 per cent), and 0.042 pounds oil, or a total of 0.514 pounds of both per horsepower hour. The 70-horsepower Gnome air-cooled engine mentioned in Bendemann's report, and weighing 2.9 pounds per horsepower, consumed 0.805 pounds gasoline and 0.253 pounds oil, or a total of 1.058 pounds of both per horsepower-hour. This being the case, the aggregate weight of the engine and supplies for different lengths of run up to 20 hours compare as follows, neglecting variations in tank weights that should add a little more to the engine of high consumption than to the more economical one. The radiator weight of the Benz engine is included:

Weights of engine, gasoline, and oil.

	For— 0 hours.	5 hours.	10 hours.	15 hours.	20 hours.
Benz ....pounds..	4.2	6.77	9.34	11.91	14.48
Gnome ....do....	2.9	8.19	13.48	18.77	24.06

Such relations as these—Bendemann report shows the weights equalize in 1½ hours' operation—lead to that most important conclusions derivable from all the competition test data in existence, viz., engines intended for short runs must be themselves light and need not be especially economical if, by sacrificing economy, lightness is promoted. Conversely, engines intended for long runs must be economical at all costs, almost regardless of weight. It may also be added, and this seems most significant, that reliability is of importance about in direct proportion to the length of run, assuming good condition to be assured before starting in each instance, so that, again on the grounds of reliability, short run engines must be light even if less reliable, measured by period of uninterrupted operation, while to long-run engines considerable weight may be added to gain reliability.

From the design standpoint, a broad principle of practice can be directly derived, to the effect that aeroplane engines being intended for more and more widely varying types of service as to frequency of flights, length of run, and load-carrying capacity, need not be of one design, style or type, but that different ones are justified and good engineering procedure demands the development and perfection to equal degrees, of as many different types and characteristics as will best serve the varying requirements of flight. From among these, a selection may intelligently be made for general service of undefined nature but with full forehand knowledge of its capabilities and limitations. All this agrees with engineering practice in other fields, for there are today not only more different steam engines than ever before, but in any one group, such as locomotives, there is greater variety than there ever was; why, therefore, should any one expect to find a single aeroplane engine or plan the development of one type to the exclusion of others? To do so, is to assume that all flights in all flying machines are the same as far as engines are concerned, which is just about as true as the assumption that a good pleasure motor-boat engine is the right thing for a trans-Atlantic ship, or that the best power plant for a tramp freighter will properly serve a battle cruiser. To be sure there are certain elements of service peculiar to flight, to which all aero engines must be adapted, but this can not be interpreted to mean that all aeroplane engines must conform to one another in arrangement, performance, or even in materials throughout.

Returning to the factors of plant weight, study of which leads to such important conclusions as the preceding, it is worth while to examine more closely the separate influences of the several component factors of accessory and supply weights.

Radiator weights must vary with the amount of sheet metal, cooling surface of given material in kind and thickness. The purpose of this surface is heat dissipation to the air, so the number of square feet and its weight will vary directly as the jacket heat loss of the engine, and directly as the mean temperature difference between water and air, but inversely as the coefficient of heat transmission. The most reliable data on this amount of heat to be dissipated, in fact the only data, is given by Bendemann, who finds that contrary to most internal-combustion engines, including the automobile class, which give up between 30 and 40 per cent of their fuel heat to jacket water, aero engines conform pretty closely to 15 per cent of the heat of combustion given to and carried by the water to the radiator. The difference, 15 to 25 per cent, is either not taken up by the water from the combustion chamber at all, passing out in exhaust gases instead, or, being taken in part by the water, is dissipated directly from jacket and water pipes to the air. In formulating the rules of the German competition, the radiator weights were assumed to conform to automobile practice and taken at 0.13 pound per 1,000 British thermal units per hour, but the experiments indicate that this should have been about 0.4 pound per 1,000 British thermal units per hour. Taking the calorific value of gasoline at the round number of 20,400 British thermal units per pound and the consumption of the more efficient water-jacketed engines as one-half pound per hour per horsepower, the heat supplied per hour per horsepower is 10,200 British thermal units, of which 15 per cent, or 1,530 British thermal units per hour, must be dissipated by the jackets. This quantity, with the constant of 0.4 pound per 1,000 British thermal unit hours would make the radiator weight 0.61 pound per horsepower of engine. Comparing this with the radiator weight of the 61.6 horsepower Green (British) engine, winner of the Alexander prize competition, which had a total weight of 46.9 pounds, the actual unit weight of radiator and connections becomes 0.76 pound per horsepower of engine, a fairly good check, considering the wide differences of design and circumstances. Winkler puts radiator weight between 0.40 and 0.55 pounds per horsepower.

It is perfectly well known how fundamentally dependent on the flow conditions of the air, on the air side, and on the presence of air or steam bubbles, on the water side, is the coefficient of heat ransmission for such apparatus as radiators, and yet this subject has scarcely been touched as a research problem, especially when it is considered that the mean temperature difference, another prime variable, is itself subject to considerable control. This will account for such differences in radiator weights as exist and is responsible for the belief that very material reductions may be expected in radiator weights following proper research or arrangements for secuirng rates of heat ransmission and on thin non-corrosive metal inclosures.

Water weights are, of course, directly under control of the designer within certain limits, as the jacket spaces may be long or short, wide or narrow, pipes short and small or long and wide, and the water space in the radiator itself, almost anything. In the same 61.6 horsepower Green engine, winner of the Alexander prize, the whole water weight was 34.1 pounds, or 0.56 pounds per engine horsepower less than the radiator weights. Winkler places this between 0.2 and 0.3 pound per horsepower. Other values for different engines are given in Table II to show the order of the magnitude of this factor.

TABLE II.—*Weights of engine accessories and complete plant weights per horsepower versus type construction.*

Name and authority	Engine alone.	Gasoline tank.	Oil tank.	Radiator and connections.	Water.	Muffler.	Total engines and accessories.	Gasoline per hour.	Oil per hour.	Gas and oil for 5 hours.	Gas and oil for 10 hours.	Plant and supplies for 10 hours.
Average values, Bendemann	......	[1]	[2]	0.63		......	......	......	......	......	......	...
4-cylinder 100-horsepower Benz, Bendemann	3.57	0.944	0.084	.626		......	5.224	0.472	0.042	2.57	5.14	10.364
6-cylinder 90-horsepower Daimler, Bendemann	3.75	1.02	.076	626		......	5.472	.510	.038	2.74	5.48	10.952
4-cylinder 70-horsepower Daimler, Bendemann	4.29	1.01	.094	626		......	6.020	.505	.047	2.76	5.52	11.540
4-cylinder 100-horsepower Daimler, Bendemann	4.29	.988	.080	.626		......	5.984	.494	.040	2.67	5.34	11.324
4-cylinder 70-horsepower Daimler, Bendemann	4.74	1.006	.062	.626		......	6.434	.503	.031	2.67	5.34	11.744
6-cylinder 100-horsepower Daimler, Bendemann	4.60	1.056	.062	626		......	6.344	.528	.031	2.99	5.99	12.33
4-cylinder 60-horsepower Daimler, Bendemann	4.89	1.002	.058	.626		......	6.576	.501	.029	2.65	5.30	11.876
4-cylinder 65 horsepower Daimler, Bendemann	5.09	.998	.120	.626		......	6.834	.499	.060	2.79	5.59	12.424
4-cylinder 95-horsepower N. A. G., Bendemann	4.33	.970	.076	.626		......	6.002	.485	.038	2.61	5.23	11.232
4-cylinder 55-horsepower N. A. G., Bendemann	4.36	1.038	.018	.626		......	6.042	.519	.009	2.64	5.28	11.322
4-cylinder 95-horsepower Argus, Bendemann	3.77	1.060	.178	.626		......	5.642	.534	.089	3.11	6.23	11.872
4-cylinder 70-horsepower Argus, Bendemann	4.38	1.176	.166	.626		......	6.34	.588	.083	3.35	6.71	13.058
6-cylinder 100-horsepower Argus, Bendemann	4.60	1.172	.134	.626		......	6.532	.586	.067	3.76	6.531	13.064
6-cylinder 100-horsepower Mulag, Bendemann	5.14	1.056	.042	.626		......	6.864	.528	.021	2.74	5.49	12.354
6-cylinder 90-horsepower Schröter, Bendemann	4.65	1.242	.094	.626		......	6.612	.621	.047	3.34	6.68	13.292
6-cylinder 125-horsepower (Hall-Scott makers)	4.32	......	......	.51	.32	......		.60	.03	......	......	......
Average of 6, British (Anzani, maker)	3.7	......	......	......	......	......	......	.54	.164	......	......	......
6-cylinder 87-horsepower (Benz, maker)	4.0	......	......	......	.138	.101	......	.557	.022	......	......	......
6-cylinder 60-horsepower (Wright, maker)	5.1	......	......	......	......	......	......	.53	......	......	......	......
Austro-Daimler "Flight"	......	......	......	[3].616 [4].589 [5].474	......	......	......	......	......	......	......	......
Green, Alexander test	5.48	.65	.15	.76	.56	......	7.60	.59	.175	......	7.65	15.25
Gnome, 1913, Lumet	......	......	......	......	......	......	3.366	.849	.255	5.520	11.04	14.41
Gnome, 1911, Lumet	......	......	......	......	......	......	2.88	.805	.253	......	10.58	13.46

[1] 20 per cent of fuel weight
[2] 20 per cent of oil weight
[3] In 65 horsepower
[4] In 90 horsepower.
[5] In 130 horsepower

NOTE.—Plant weights are given without muffler.

Tanks for gasoline and oil will weigh more for large than for small supplies, but not in proportion to their volumes, as shape, thickness and kind of material will determine the square feet of metal and weight of the tank per cubic foot of capacity as much as the volume. Other things being equal, that shape of tank will weigh least that has least weight per cubic foot of volume, and cylindrical tanks are most economical of metal weight, needing no stays, so the ratio of length to diameter is an important factor, which, however, also affects wind resistance, but these variations are not of such an order of magnitude to warrant detailed study here. The above-noted Green engine, 61.6 horsepower, and a gasoline tank of 70 gallons weighing 39.7 pounds, and a lubricating-oil tank of 6 gallons weighing 9.2 pounds, so that the net weights are: Gasoline tank 0.65 pound and oil tank 0.015 pound per engine horsepower, or 0.57 pound per gallon for 70 gallons and 1.54 pound per gallon for 6 gallons. Bendemann gives the round number of 0.2 pound tank weight per pound of gasoline or oil, which does not check the above figures. Tanks used in tests, he writes, are frequently too light for actual service, which indicates a necessity for standardizing tank-metal thickness, shape, and to some extent size, as large capacity may be just as well carried in several small tanks as in one large one and with better weight distribution on the frame, as well as affording a measure of safety.

Gasoline consumption for the better water-jacketed engines averages very closely 0.5 pound per hour per brake horsepower (B.H.P.), and for the rotating-cylinder air-cooled engines about 0.8 pound for full load, though, as might be expected, there are quite wide variations with type of engine and its condition as to cleanliness, adjustment, load and speed. There is practically no data available on the rise of consumption with poor adjustment of carbureter, ignition, leaky valves or pistons, gumming bearings, carbonized combustion chamber, or even at speeds other than normal, or throttle positions other than wide open. It is not possible from test data to even approximate the gasoline consumption of an aero engine in actual flight service, though, judging from data on other classes of gasoline engines, it may easily be double this best value obtained by perfectly tuned new engines in competitive tests. We have many figures on total consumption of gasoline and oil during competition flights, but horsepower of course was not determined, and such figures must be compared with each other to give a true picture of range of possible variation. Even here, however, the operators are skilled and on their mettle, so they may be expected to better ordinary every-day flight consumption. These engine-test figures may be translated into thermal efficiency approximately by taking the average calorific value of American gasoline at 20,400 British thermal units per pound, making the engine heat consumption for the two typical classes 10,200 British thermal units and 16,320 British thermal units per hour per brake horsepower, equivalent to $\frac{2545}{10200} = 25$ per cent and $\frac{2545}{16320} = 15.6$ per cent thermal efficiency referred to brake horsepower. With the actual consumption of the Benz engine of 0.472 pound, Bendemann reports a thermal efficiency of 29 per cent, which requires that the gasoline used have a calorific value of 18,900 British thermal units per pound, which is the value used by Güldner for European gasolines. Other figures indicate about an equivalent difference between the American and European fuels which could be accounted for by the prevalence of paraffins and olefins, respectively, in each, even if of equal density.

Such a thermal efficiency as this high value is truly remarkable, and under the condition of operation and size of aero engines can hardly be bettered, judging from other experiences and from fundamental conditions to be examined later, but the low value is too low to be tolerated without adequate compensating advantages in engine weights for short flights and in the reliability and adaptability factors. Actual test values for specific engines and tests are reported in the appendix and need not be detailed here, but attention is again called to the practical importance of consumption data on other than these best conditions to show not only how high it may be in service, but also how sensitive it is to each individual adjustment and operating condition that may exert an influence.

Oil consumption is a thing that seems to follow no particular law, however much may be known about contributory circumstances, such as chemical character, viscosity, mode of application, surface speed, pressure and temperature, air evaporation, combustion, chamber carbonization and cracking, and exhaust discharges. Beyond the more or less general adoption of castor oil to avoid gasoline absorption in the crankcases of rotating-cylinder aero engines, and the use of most widely different systems of feed and bearing conditions, this is a practically wide-open field of research. In all the competition tests the oil consumption has been made a subject of measurement, but no analysis of causes of consumption has been made, nor are there any data on the relative consumption of different oils or of different oiling sytems for a given engine. The figures must be taken for no more than they really represent, viz., what was used, but it can be assumed that they are no guide whatever to the oil that will be consumed in actual service, except when consumption is fixed by a pump plunger displacement. Nor do these figures aid in fixing the least value attainable after proper thorough research on the lubrication of a given engine, which is rather more a matter of reliability and engine life than of oil weight to be carried. In the German tests values were found ranging from 0.009 pounds to 0.089 pound per hour per brake horsepower for the water-cooled engines, and from 0.145 to 0.253 pound per hour per brake horsepower for the rotating air-cooled cylinder engines. The only conclusions derivable from these figures are that there is a very wide variation—about 25 to 1—proving the need of study, and that on the whole the rotating air-cooled cylinders are much greater oil consumers than the fixed water-cooled.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

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THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

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MODEL AERO CLUB OF OXFORD
Oxford, Pa.

World's Model Flying Records

(TWIN PROPELLER PUSHER TYPE MODELS)

MONOPLANE

Year 1916. Thomas Hall (America), hand launched, distance, 5,337 feet.

Year 1915. Wallace A. Lauder (America), hand launched, duration 195 seconds.

Year 1914. Fred Watkins (America), rise off ground, distance 1,761 feet.

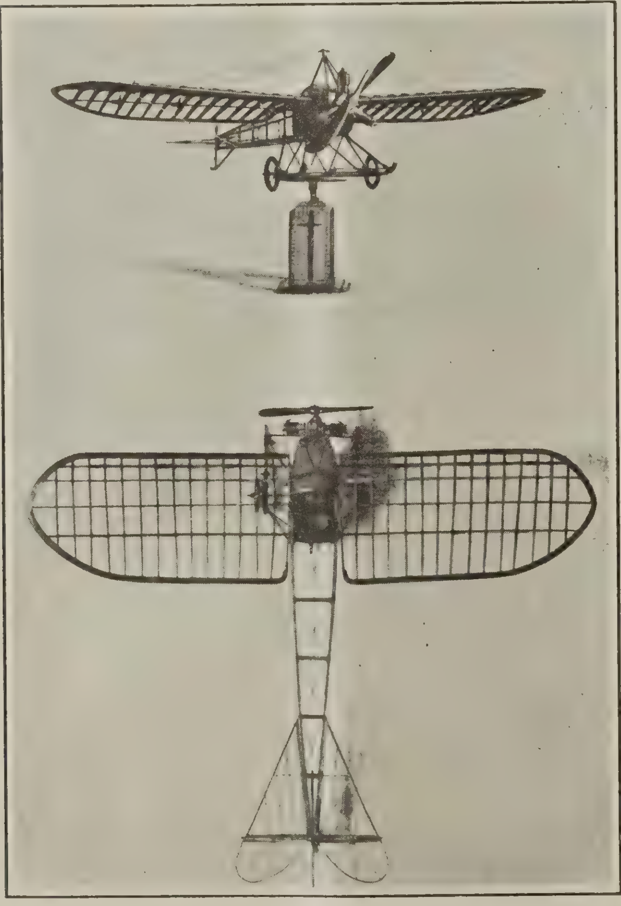
Year 1914. J. E. Louch (England), rise off ground, duration 169 seconds.

Year 1915. E. C. Cook (America), rise off water, duration 100 seconds.

(TWIN PROPELLER TRACTOR TYPE)

MONOPLANE

Year 1913. Harry Herzog (America), rise off water, duration 28 seconds.



Miniature reproduction of American designed monoplane.

(TWIN PROPELLER PUSHER TYPE)

BIPLANE

Year 1915. A. H. Wheeler (America), rise off ground, duration 143 seconds.

(SINGLE PROPELLER PUSHER TYPE)

MONOPLANE

Year 1914. J. E. Louch (England), hand launched, duration 95 seconds.

Year 1914. W. E. Evans (England), rise from ground, distance 870 feet.

Year 1914. J. E. Louch (England), rise from ground, duration 68 seconds.

Year 1914. L. H. Slatter (England), rise from water, duration 35 seconds.

(SINGLE PROPELLER TRACTOR TYPE)

MONOPLANE

Year 1915. D. Lathrop (America), hand launched, distance 1,039 feet.

Year 1915. D. Lathrop (America), hand launched, duration 240 seconds.

Year 1914. C. D. Dutton (England), rise from ground, distance 570 feet.

Year 1914. J. E. Louch (England), rise from ground, duration 94 seconds.

Year 1915. L. Hittle (America), rise from water, duration 116 seconds.

(SINGLE PROPELLER TRACTOR TYPE)

BIPLANE

Year 1915. Laird Hall (America), rise from ground, duration 76 seconds.

(FLYING BOAT TYPE)

MONOPLANE

Year 1915. Robert La Tour (America), rise from water, duration 43 seconds.

(FLYING BOAT TYPE)

BIPLANE

Year 1914. C. V. Obst (America), rise from water, duration 27 seconds.

(MECHANICAL DRIVEN MODEL)

Year 1914. D. Stanger (England), rise from ground, duration 51 seconds.

(All British records are quoted from *Flight*.)

Texas Model Aero Club

HAMER SMITH

The Texas Model Aero Club held its contest for hand launched duration Sunday, May 28th, at the Army Post Drill Grounds. The meet was postponed from the Sunday before because of bad weather. Nevertheless, the weather of the 28th was still worse, as a gusty wind, almost a gale, swept over the grounds all the day and brought almost every model to the earth with a smash. Only one flight mastered the wind and that was only 85 seconds. Despite the fact that the duration was so short and the model was traveling in short circles, it was almost lost to sight by the timers because of the effect of the strong wind.

During the day Carl Gildmeister smashed two models while Hamer Smith smashed three. Luckily all the smashes were in the form of broken fuselages, which is the easiest part to construct.

San Antonio, Texas.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

"In the Nick of Time"

[*Our own contribution to Shakespeare's Tercentenary*]

A MELODRAMA

By R. E. de Castro

Scene: Sheepshead Bay

PEOPLE IN THE PLOT:

1. Ruth Law—the fearless aviatrice.
2. Captain Thomas Baldwin.
3. Ruth Law's intrepid manager.

The plot: Altitude competition is in progress, with Ruth Law, Steve Mac Gordon, and Victor Carlstrom as entrants. Victor Carlstrom has completed a flight. Miss Law and Steve Mac Gordon are still out of sight and a bomb dropping contest is about to start. Baxter Adams, Tex Millman, and Victor Carlstrom are ready to begin:

RUTH'S MANAGER:

The time draws near to start and Ruth away!
I have scanned the heavens to see her in her flight
And woe is me! The girl can not be seen.
I fear she will not reach the earth in time
To share the "easy money" given out
To those who hit the mark while flying high.

CAPTAIN BALDWIN:

But wait, that yonder speck afar, I think,
Is Ruth returning from the skies. No doubt
With records shattered in a flight, which
Spread across Achievement's golden page
Shall read, "All records broken by Ruth Law."

RUTH'S MANAGER:

It is not so, for yonder speck on high
Is but a soaring starling in its flight.
Again I say, the "easy money" comes
And Ruth—Ah, Ruth—she is not here as yet
While golden coins are fading fast away.

CAPTAIN BALDWIN:

Fear not my man, if Ruth returns too late
A special prize of gold I'll offer her
If by her skill she outscores these three men
Who, now ascending, dropping bombs from high
Shall no doubt win the prize by aiming true.

Ruth's Manager is appeased. The three men ascend and the contest is won by Baxter Adams, with Tex Millman second and Victor Carlstrom third. Ruth Law at last comes down, winning second prize in the altitude contest. Manager breathes sigh of relief.

RUTH'S MANAGER:

At last, oh Ruth, you have returned to earth
And none too soon, for now as darkness falls
Another contest now awaits you here.
'Tis that of dropping bombs while in mid air
For Captain Baldwin's prize in coins of gold.

Ruth ascends and makes a better mark than the other competitors. She receives the prize.

RUTH'S MANAGER:

Honor falls on you once more, while
Others beaten in the contest true
Can now but bow to your superior skill
And try again, mayhap some day to win.
But while your faithful aero skims the earth
And you retain your strength and sight of eye
While I the contests for you shall arrange,
Your name (and mine) shall make the welkin ring
And you will be the center of all eyes.

It is now 7:30 p. m. Darkness has fallen. The crowd (both of them) gives a cheer.

CURTAIN.

It Depended

Visitor—"What's the new structure on the hill there?"

Farmer—"Well, if I find a tenant for it, it's a bungalow; if I don't, it's a hangar."

Too True

She— "When you married me you didn't marry a cook, I want you to understand."

Aviator (sadly)—"I know it."

Taking Awful Chances

"I have terrible news for you, Freddie, your pilot has just run away with your wife."

"Good heavens, the recklessness of those pilots is simply awful!"

Took Him Literally

As an aerobus was leaving the harbor of Athens a well-dressed young passenger approached the captain, and, pointing to the distant hills, inquired:

"What is that white stuff on the hills, Captain?"

"That is snow, madam," replied the captain.

"Well," remarked the lady. "I thought so myself, but a gentleman just now told me it was Greece."

Motion in Order

"Jiggs's wife speaks ten languages."

"I move we adopt resolutions of sympathy and send them to Jiggs."

And Shortly Thereafter Mr. Wad Found Out How They Lit. **By GALE**

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VOL. III NEW YORK, JUNE 19, 1916 No. 14

Thirty Aeroplanes Ordered in One Month

ORDERS aggregating twenty aeroplanes have been placed during the past week by the War Department, according to information received by the Aero Club of America. This brings the total of aeroplanes ordered by the War Department in the past month to thirty, and this action is looked upon by the officers of the Aero Club of America as an indication of what may be expected from the new administration of the aeronautic section of the Army, of which Lieut.-Col. George O. Squier, who recently returned from London, where he was attached to the Embassy, is the head.

The order given recently to the Curtiss Aeroplane Company for enough Model JN and Model R type machines to equip the Aero Squadron serving with the Mexican expedition, has been followed by an order for eight Martin biplanes and twelve Day biplanes. The eight Martin machines are two Model F seaplanes, equipped with 125 h.p. Hall-Scott motors, to go to the Philippines, to be added to the six machines of that type, four of which are already in service there, and two are being shipped. The other six Martin machines will be of the 90 h.p. Curtiss motor type, and will go to the San Diego School, making fourteen machines of this type that the U. S. Army School at San Diego will have.

Brig. Gen. George P. Scriven, the head of the Signal Corps, testified before the Committee on Military Affairs of the Army recently, and stated that the United States Army needs 660 aeroplanes. While there is very little likelihood that Congress will allow an appropriation large enough for that number of aeroplanes, there seems to be no doubt that when the Army Appropriation comes before the House on June 21st, Congress will allow at least $5,000,000 for aeronautics in the Army and Militia. The Aero Club of America has written to each Congressman, pointing out that to carry out the modest provision of the Chamberlain-Hay Army Reorganization Bill, which was signed by President Wilson a few days ago, but which did not deal with the appropriations necessary to carry the bill into effect, it will require at least $3,200,000 for aeroplanes alone. This bill provides for the organization of eight aero squadrons, which cannot be organized and maintained for a year for less than $400,000 for each squadron. The Aero Club of America is also urging the acquisition of dirigible balloons and kite balloons for the Army, to provide for which would require an appropriation of at least $2,000,000.

It is also being urged that, whereas in adopting the Chamberlain-Hay Bill the country has adopted the policy of depending largely upon the National Guard for the defense of the country, steps should be taken to immediately organize an aviation detachment of not less than six aeroplanes for the National Guard of each State. To organize, equip and maintain such a detachment, it would cost $100,000 for each State, or $4,000,000 for the forty States which are ready to organize such a detachment and have been begging the Aero Club of America for assistance to obtain aeroplanes and train officers. There are now forty officers of the National Guard of the different States being trained at the expense of the National Aeroplane Fund, instituted by the Aero Club of America for that purpose.

Congressman Tilson Favors Larger Aeronautical Appropriation

REPLYING to the letter of the Executive Committee of the Aero Club of America, which pointed out that the Army needs $5,000,000 for aeronautics, and the Militia needs $4,000,000, or $100,000 for each of the forty States which are ready to organize aviation sections, Congressman John Q. Tilson, of Connecticut, has written to Mr. Alan R. Hawley, President of the club, as follows:

"My dear Mr. Hawley:

"I am in receipt of your extended communication of the 29th ultimo, which I have read with considerable interest. I am one of those having great faith in the aero machine and have voted and worked for the greatest possible recognition in every bill that has been considered since I have been in Congress. In my humble opinion the most serious difficulty has not been with Congress, but with the Executive Department, or, to be more accurate, with the Army itself. The Army experts ought to lead the way and give such information and make such presentation of the matter to Congress that there would be no difficulty in securing whatever appropriation was thought necessary. I am sorry to say that the Army has not done this, and that Congress has been left somewhat at sea as to appropriations for aircraft development.

"Very truly yours,

(Signed) "JOHN Q. TILSON."

Recently Hon. Julius Kahn, ranking member of the House Committee on Military Affairs, also wrote to Mr. Hawley making a similar statement. Mr. Kahn stated that if the amount allowed by Congress for aeronautics is insufficient the fault lies with the War Department, and not with the Committee on Military Affairs, as the Committee has allowed every cent that Secretary Baker asked for. Unfortunately Secretary Baker only asked for an appropriation sufficient to buy 32 aeroplanes. The immediate need is for at least ten times that number.

Needed—A Constructive Head

(Editorial in Springfield *Republican*)

CREATION of an aviation corps is as logical now as attachment of the air service to the signal corps was in the early experimental days. Just what the aeroplane could do was uncertain, and its most obvious use was in reconnoissance, which fitted in well with the work of the signal men. That service is still of prime importance, but the experience of the war is showing that the possibilities of the air fleet are great and varied. They include much of the work done by cavalry as well as the work which fell to the signal corps, and they call for machines of different types. Some are made for fighting, others for bomb dropping, some for scouting. In one case high speed for a short distance may be required, as for destroying enemy scouts. In another case stability and power to keep the air for a long time in all kinds of weather may be paramount. The problem should be taken as a whole, and Secretary Baker will be warranted in arranging for a distinct corps. England's troubles in aviation have largely come from making the air service a stepchild of army or navy. Its development needs a constructive head in full sympathy with this 20th-century arm.

America Must be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

Who Will Punish the Administration?

IT is stated that the War Department will punish the Guardsmen of the states of Arizona, New Mexico and Texas who have failed to respond to the call to duty, to go to the Mexican border to defend American lives and property from the attacks of Mexican bandits.

It so happens that the National Guard of these three states have from time to time made strong appeals for equipment and the only response they received was a letter stating that the War Department did not have the funds necessary to supply the equipment requested.

Of course, the War Department wishes that it were in a position to supply this equipment. Unfortunately, the Bryanite Administration in the past three years has refused to listen to the advice of the authorities and the demands of the people. It sacrificed national safety for political expediency, and starved the Army, Navy, and Militia.

The Guardsmen may be punished—but so will the Administration. November is coming fast.

The Eyes of a Navy

(Editorial in New York *Times*.)

THE utility of air service in modern warfare was not more clearly illustrated, perhaps, in the Skagerrak battle than it often has been on land since the European war began, but the lesson conveyed to the men who are responsible for the strengthening of our national defenses by the employment of airships as a Navy's eyes was so sharp in its directness that it will probably be heeded when, after a fortnight of inevitable delay, the Naval bill is brought up in the Senate. The Naval Committee of that body will defer its consideration of the bill until June 13, and its report will not be made until a week or so later. Provision for two superdreadnoughts seems to be assured, but the present provisions for naval air service need clarification. The appropriation allowed by the House, $3,500,000, is probably large enough for the first year, but the Navy will practically be compelled to begin at the very beginning in the establishment of an Aerial Service. At present the Navy is blind. Thus far its Air Service has been purely experimental, and, like aviation in the Army, has been chiefly valuable in proving its own inadequacy.

The Army and Navy Register of Washington points out that the language of the clause creating a new Naval Flying Corps, "whose particular duties shall be in connection with the operation, maintenance, and activities of aircraft in all its phases and in the education and training of personnel for all duties connected therewith," is questionable. It is not likely that the framers of the bill intended to transfer responsibility for the design, construction and repair of aircraft to the Flying Corps, but the construction and design of machines so necessary for national defense should be supervised by men who have learned all the lessons of aviation. We are not the only people in the world who have been backward in realizing the military importance of the aeroplane, but our neglect of it has been shameful, considering that the heavier-than-air flying machine was an American achievement. The Army needed its Mexican experience to stimulate the development of its air service.

The time will come when the aerial branches of the Army and Navy will be organized as distinct forces, with their own commanders. An air General and an air Admiral are conceivable. Meanwhile, we must begin the work of real development with an intelligent comprehension of its difficulties and its possibilities. There are encouraging signs of an awakening in both the Navy and War Departments. The National Guard aviators are to receive substantial Federal support. Admiral Peary's plan for an aerial coast guard on both the Atlantic and the Pacific coasts, set forth so graphically in the *Times* recently, stimulates the imagination. It is surely worthy of the attention of the Government. Its cost would be inconsiderable in proportion to its value as a means of defense.

Aerial Eyes for Our Troops

(Editorial in New York *Press*)

There is hope still that the United States, despite the impetus given to aeroplane construction in Europe by the war, may yet regain the rightful position in aeronautics which its original distinction as the home of the first successful aeroplane demands it should have. Entries for the transcontinental aeroplane race in September, for which the Aero Club of America has offered a first prize of $20,000, reveal that there are, either already built or under construction, eleven types of aeroplanes, each equipped with two motors, with power ranging from 80 horsepower to 320 horsepower. The import of this is apparent when it is remembered that Europe possesses only two or three types of twin-motored aeroplanes.

It has been private initiative and not governmental aid, however, which has fostered the development of these flying machines. Our record of governmental indifference to this new art, which is so important now in warfare that frequently the issue of battles depends upon supremacy in it, is one which cannot be matched elsewhere on the face of the globe. There are a dozen European aviators, for example, who have brought down more enemy planes than are in commission in the United States Army.

The facts justify the Aero Club of America in its demand that $5,000,000, instead of the $1,000,000 provided for in the Chamberlain-Hay Army Bill, be appropriated to purchase and maintain aeroplanes, dirigibles, observation balloons and kites for defense.

In these days an Army without sufficient air scouts is blind, and a blind man who tries to fight is a pitiable sight. Just as Congress has always been reluctant to give our Navy enough men to man the ships as fast as they come from the ways, so it demurs at giving aerial eyes to our soldiers. But this thing must not be permitted to go on.

It is hopeful for the country that the Republicans in Congress, aided by a few Democrats, forced through an increase from $2,000,000 to $3,500,000 for aeronautics for the Navy. Now let similar action be taken for the Army.

The Age of Wonders

(Editorial in Des Moines *Capital*)

THE transcontinental aeroplane flight, plans for which have been announced by the Aero Club of America, promises to make the year 1916 go down in history.

On Sept. 2 a fleet of aeroplanes will leave New York City with messages from the governor of New York to the governor of California. Suitable prizes have been offered for the aviator who first completes the flight.

This contest has been hailed with delight by those who have felt keenly the neglect which the Government has practised with reference to the aeroplane. The product of American inventive genius has been picked up by other countries and developed beyond measure, while in the United States it is still struggling for an existence.

One of the objects of the race is to arouse Congress to the necessity of making suitable appropriations for an aeroplane division of our Military forces. It is also hoped that aviators will receive the necessary training in preparing for the contest to make them fit for duty with the Army should the need arise.

If the flight is successful the present generation will have seen transcontinental travel grow from the old prairie schooner to the steam railroad and finally to the aeroplane. Truly it is an age when wonders never cease.

Work of the Aero Club

(Editorial in Grand Rapids *News*)

Of all the national defense organizations, the Aero Club of America is by far the most active. It is impressing upon the minds of the people the necessity of the airship as an important feature of Army service. Much money has been raised and much more is being raised, and the men behind this organization deserve much credit.

Just now the club will supervise a transcontinental aeroplane competition. The first prize will be $20,000, and there will be a possible total of $100,000 to be distributed.

It is the view of the executive committee of the club that the transcontinental competition will result in:

1. Inducing civilian and Militia aviators to train and equip themselves and form a reserve of trained aviators.
2. Break in and train civilian aviators for the Army.
3. Form a body of trained aviators which, in case of war, could inspect and protect the railways.
4. Demonstrate to the people the value of aeroplanes and emphasize the necessity of larger appropriations for the Army, Navy, Militia, Coast Guard, and post office.
5. Establish a permanent transcontinental aerial highway with landing stations at intervals of between 20 and 50 miles.
6. Afford a supreme test of American aeroplanes and motors and bring out the best types.

It is expected that at least 50 American aviators will take part in this contest. It is now planned to hold the contest toward the end of August. Some years ago there were several such contests in America, when the excitement over flying machines was at fever heat. During recent years, however, interest in them has dwindled. The aim of the club is to inspire a new interest, so that America can compete with the powers of Europe, if occasion ever demands.

THE NEWS OF THE WEEK

Proposed Plan to Unite Aeroplane Companies

It is understood that a movement is in progress to bring about a consolidation of the Wright Company and the Curtiss Aeroplane Company. To this end it is proposed to form a new corporation with an authorized capital stock of $30,000,000. According to Wall Street reports, it is planned to increase the present preferred stock of the Curtiss Company from $6,000,000 to $10,000,000 by the issuance of $4,000,000 in new preferred stock; put out a new issue of $5,000,000 of secnod preferred; leave the present $3,000,000 Curtiss Company 5 per cent serial notes outstanding and increase the outstanding common stock from the present 150,0 00shares of no par value to 200,000 shares of no par value.

If the negotiations under way are carried out, it is figured that the preliminary work will be completed within the next week or so, after which a meeting of the representatives of both companies will be called to discuss terms under which each will go into the merged corporation.

The Curtiss Aeroplane & Motor Company was incorporated in this State last January to take over the business founded by Glenn H. Curtiss for the manufacture of Curtiss aeroplanes, flying boats and motors. In February the company took over the stock of the Burgess Company and secured the services of W. S. Burgess. The Wright Company was organized in 1909 with its principal plant at Dayton, O., and in October last year control of the property was purchased by a syndicate of New York bankers.

It is stated in the financial district that if the merger is carried through it will terminate the litigation now pending between these two companies over patent rights.

It is reported that the promoters of the combination will hold an important meeting in the course of a few days, when a definite plan will be agreed upon.

Navy Tries Steam for Seaplanes

Navy Department experiments indicate that steam driven seaplanes may solve the motor problem of aerial navigation (according to press despatches). Many officers believe that only the question of getting the weight of the steam plant down to the lowest possible figure remains to be answered before a "steamship in the air" is constructed and tried.

Experimental work was begun many months ago, and an improvised plant, consisting of a boiler similar to those used in steam automobiles and a compact steam turbine, has been thoroughly tested. Those in charge of the work will not discuss it further than to say that they are very hopeful of a successful outcome.

Steam equipment would guarantee constancy of power, upon which aeroplanes depend for stability. Most accidents to aviators, it is emphasized, have been due to failure of motors.

Steam turbines also would provide power far in excess of anything now obtainable with gasoline engines, it is said, a factor vital to the Navy, since seaplanes are much heavier than aeroplanes for service over land.

Standard Aero Company Gets Contract

A Government contract for twelve aeroplanes and ten extra motors has been awarded the Standard Aero Company, successor to the Sloane Manufacturing Company, of Plainfield, N. J. Eleven bids were received. Secretary of War Baker sent a committee composed of Captain Clark, Lieutenants Jones and Milling, and Mr. Souther, to visit the various plants of the competing companies, where different types of machines, drawings and the capacity of the works were considered. The committee reported its findings, with the result that the Standard Company was awarded the contract, which must be fulfilled within ninety-two days.

The aeroplanes will be Day tractors, H-2, biplane type. The wing spread is 40 ft., the overall length 28 ft. 3 in., the area of the main planes 500 square feet. The weight of such a machine is 1,700 pounds; loaded, 2,700 pounds. The fuel capacity is 4½ to 6 hours. In a machine of this type DeLloyd Thompson last April made an altitude record of 13,500 ft. The New York National Guard, after an official test, purchased one of them recently. The test developed a speed of 85.68 miles an hour, and a climbing speed of 3,000 ft. in 6 minutes 55 2-5 seconds. The predecessor of the Standard Company obtained a contract from the English government last fall.

Export of Aeroplanes

Exports of aeroplanes and parts in the week of June 4 were as follows: To Norway, $5,500. To Scotland, $750.

Some members of the National Aerial Coast Patrol Commission, with the hydroaeroplane in front of the offices of the Commission, Coast Survey Building, Washington, D. C. Left to Right—Hon. Wm. M. Ingraham, Assistant Secretary of War; Congressman Julius Kahn, of California; Rear Admiral Robert E. Peary, Chairman; Hon. Byron R. Newton, Assistant Secretary of the Treasury; Congressman Charles Lieb, of Indiana; Professor H. C. Frankenfield, Chief Forecaster, U. S. Weather Bureau; Mr. Ripley Bowman, of the Aero Club of America; Captain Ralph L. Taylor, aviator, of the Connecticut National Guard; Mr. Earl Hamilton Smith, Secretary.

The Late Steve MacGordon

Steven MacGordon, aviator at the Atlantic Coast Aeronautical Station, died on June 6th from burns received when his aeroplane was destroyed by fire.

With student E. C. Keefer of Canada, they were coming down for a practice landing in a new JN 4 Curtiss Tractor, the student in the pilot's seat and the instructor in the student's seat forward; this is the customary procedure when a student is about ready for his license trials, so that he will become accustomed to landing the machine while in the rear seat.

They landed all right and started the motor up for another flight when the propeller hit the ground on account of the machine being nosed over too much.

The propeller broke and the vibration due to the racing motor shook the engine beds loose enough to permit the end of the shaft to tear a hole in the gasoline tank. The gasoline poured all over the machine and caught fire. This, of course, all happened in a second and before the student was able to shut the motor off.

Keefer freed himself and jumped from the machine, throwing his hip out and suffering from severe burns. But MacGordon, being in the front seat, was not as fortunate and was unable to get free of the machine until it had almost stopped and his clothes were all aflame. Several of his students rushed at him and tore his clothes off, but he was terribly burned. However, he was still conscious and told the boys that he was all right.

Cogswell, who was also flying at that time, noticed the fire and flew to the hangars, where he notified Carlstrom and they rushed over in the latter's car and got the two men to the hospital in a few minutes, Mac walking to the car, Keefer being carried.

MacGordon was thirty-three years old and a native of New York City. One of his latest achievements was a non-stop flight from Newport News to Sheepshead Bay, where he took part in a tournament last week.

Lieut. R. C. Saufley Killed

Lieut. Richard C. Saufley, Navy Aviator, was killed June 9, when his machine fell on Santa Rosa Island, Florida.

The Navy Department was notified that aeroplane A-H-9, in which he was flying, fell with the aviator and that the accident was due to the machine in some way having damaged tails. The wife of Lieutenant Saufley was formerly Miss Helen O'Rear of Frankfort, Ky., the daughter of E. C. O'Rear, former Chief Justice of Kentucky, now a delegate to the National Republican Convention at Chicago. She was at Pensacola when her husband was killed.

Flying with Lieutenant Saufley amounted almost to positive genius, according to Naval officers who knew him. He had been stationed at Pensacola all winter, engaged in experimental work and training young aviators for the Navy. Last December, in the aeroplane A-H-8, with another officer as an observer, he made a sixty-mile scouting trip over the Gulf of Mexico from Pensacola in the first of a series of Naval scouting experiments.. In March he broke the world's altitude hydroaeroplane record at Pensacola, when, flying alone, he rose 16,072 feet. On a previous flight, with a passenger, he made an altitude of 8,340 feet. These were both world's records for a hydroaeroplane and were made in Curtiss machines. Lieutenant Saufley during the winter also made a series of successful flights from the deck of a warship in an aeroplane launched from a catapult. Recently, at Pensacola, he made a flight which lasted one hour and eight minutes.

Lieutenant Saufley was born at Stanford, Ky., Sept. 1, 1884, and was a son of Judge Micah Saufley. He was educated at Center College, Danville, Ky., and in 1904 was appointed to the Naval Academy, where he stood near the top of his class on graduation. Several years ago he was assigned to the aeronautic branch of the Naval service at his own request.

Sturtevant Aeroplane in Parade

In the great Preparedness Parade in Boston, held on May 27, one of the most striking features in the parade and an exhibit that attracted a great deal of very favorable comment was the delegation and display of the Sturtevant Aeroplane Company.

In the eleventh division of the parade about fifty employees of the Sturtevant Aeroplane Company marched at the head of the exhibit, following them there was towed the fuselage of a new Sturtevant Model S Tractor built for the U. S. Government, and behind this there followed another section towing the wnigs of this machine on a truck.

The entire exhibit showed a Military aeroplane of the most modern type being transported by use in the usual Military Service manner.

In the same section as the Sturtevant exhibit in the parade there marched a delegation from the Mass. Independent Aviation Corps, carrying a novel display banner.

While the marchers were showing the hundreds of thousands along the route what preparedness enthusiasm means a Burgess machine with a Sturtevant motor flew gracefully over head. This was the first time that a modern Military steel aeroplane was displayed to such a large assemblage and from the favorable comments made, after the parade, it is apparent that the exhibit was most beneficial in educating the public to a more intelligent appreciation of what the country needs.

Personal Paragraphs

The Patterson Aviators report that they will present their "Battle in the Sky" at Boise, Idaho, July 3 and 4.

The Sturtevant All-Steel Battleplane, being towed through the streets of Boston during the Preparedness Parade. Mr. Grover C. Loening, vice-president of the Sturtevant Aeroplane Co., is shown driving forward car.

Activities at the Essington School

To assist the cause of national preparedness Mrs. Paul Denckla Mills, widely known society matron of Philadelphia, steered a hydroplane at the Philadelphia Aviation School, at Essington, which was founded for the purpose of establishing an aviation corps to be called on in time of national emergency. Although she went up with Walter Johnson, instructor at the school, a week ago, this was the first time she attempted to steer the craft herself.

Mrs. Mills was accompanied by Mr. Johnson, who surrendered his seat to her. Her first lesson consisted of a short spin from the aviation field toward League Island, and during the trip of ten miles, which was made in 15 minutes, the fair pupil contented herself with just skimming the surface of the river, hopping in long jumps across the ripples. On the return Johnson praised her skill and declared her to be a most promising pupil.

Other flights have been made by John B. Stetson, Jr.; Alexander Brown, George L. Larrabee, of New York; Edward Brouse, W. J. Shaffer, William Carter and Dudley Norton. Among the other members of the class in flying are George B. Thomas, Jr.; J. J. McNally, H. S. Graham, Jr.; F. H. Maguire, S. H. Noyes, A. J. Antelo Devereux and Wilson Potter.

Robert E. Glendinning has given the use of his flying boat, "Bess," to the school. George B. Thomas, Jr., is buying a boat for his own use.

Aero Platform Plank Asked

Telegrams urging an aerial preparedness plank were sent by the Aero Club of America and thirty affiliated clubs to leading delegates to the Republican and Progressive conventions. Among the men who received them are Senators Lodge, Borah, Sutherland, Smoot and Penrose, Chairman Hilles, Frank H. Hitchcock, Chauncey M. Depew and W. Murray Crane. The telegram says in part:

"Press despatches state that you demand a plank in the Republican platform asking adequate defense on land and water. You should go further and demand aerial preparedness. The United States gave the world the first practical aeroplane; the Roosevelt administration in 1907 gave the United States Army the first aeroplane ever given to an army, and for three years we held the distinction of being the only country in the world having an aeroplane in use for military purposes. This country now ranks twenty-third in aeronautics and is behind all the second and third class powers and their colonies.

"Every consideration of the country's safety demands that full consideration be given to aerial preparedness, and the Aero Club of America and the thirty affiliated aero clubs urge both the Republican and Democratic National Committees to include the aerial preparedness plank in their platforms."

Aeronautical Activities of New York Naval Militia

On Saturday, May 13, the flying boat "M. N. N. 1," belonging to the First Battalion Naval Militia, N. Y., was shipped to Bay Shore, L. I., by motor truck. Two officers and eight men reported for duty. The plane was later set up and a temporary covering of canvas was erected.

On Saturday, May 20, two officers and six men reported for duty, and a test flight of ten minutes was made by Lieutenant Lee H. Harris, commanding officer of the section. On Decoration Day one officer and three men reported for duty. Flight was not attempted as water conditions were too rough.

A canvas hangar has been ordered by the Navy Department, and will soon be erected on the site. Instruction began on June 3.

General Aeronautic Co. Increases Capital

The General Aeronautic Company, with its registered office in Bloomfield, filed a certificate in the office of Secretary of State Martin increasing its capital stock from \$300,000 to \$1,500,000. The certificate was signed by its officers, R. K. Mickey, president, and M. C. Klein, secretary.

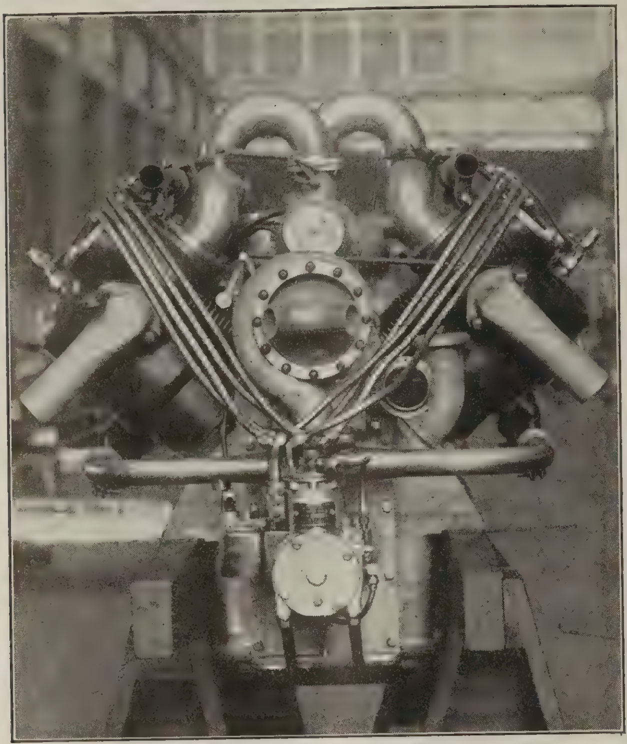
Federal Aircraft Co. Acquires Flying Field

The Federal Aircraft and Motor Corporation, of 1790 Broadway, have taken over the entire aviation field of eight hangars at Staten Island formerly used by the Aeronautical Society. The hangars are being painted, the field is being graded, and when this work is complete the field will be an excellent one for school purposes.

Pennsylvania News

The committee on the aviation events to be held on Navy Day, June 17, in Philadelphia, has been very active. Mayor Smith was visited by a delegation of officers from the League Island Navy Yard and was urged to lend his support to the events. The Mayor gladly consented to open the exercises with an address and he will appoint a citizen committee to aid in the program. The scholars of the schools of Philadelphia are expected to attend in a body with guides. The Aero Club of Pennsylvania has arranged for the finest exhibitions of flying ever held in the vicinity of Philadelphia. Messrs. Kays and Figgelmessy of the club are scheduled to fly their Sloan tractor and Mr. Glendenning will fly his Curtiss boat "Bess." There is also a possibility that Mr. Clarke Thompson will give exhibition flights in his Curtiss machine. It is expected that a delegation from the Aero Club of America will attend.

The formal opening of activities at the Essington Aviation School, Philadelphia.



A Sturtevant Model 5, 140 H.P., eight-cylinder aeroplane motor, showing the installation of the Christensen air self-starter.

National Advisory Committee Meets

The Executive Committee of the National Advisory Committee for Aeronautics met at the Smithsonian Institution, Washington, D. C., on the 8th instant, with a number of representatives of aircraft and aeronautic motor manufacturers to consider the present status of motor construction and design, and the difficulties being experienced in practice.

This was the first of a series of meetings to be held between the members of the National Advisory Committee and aeronautic motor manufacturers of this country, in an effort toward co-operation in the development of motors for aircraft, and in an endeavor to standardize aeronautic motors and accessories.

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, presided as Chairman of the Executive Committee. The other members of the committee present were: Prof. Joseph S. Ames, of Johns Hopkins University; Captain Mark L. Bristol, U. S. Navy, Commander of the Air Service; Prof. Charles F. Marvin, Chief of the Weather Bureau; Prof. Michael I. Pupin, of Columbia University; Dr. S. W. Stratton, Director of the Bureau of Standards; Naval Constructor H. C. Richardson, U. S. N., Secretary; and Lieutenant Colonel George O. Squier, in charge of Aviation Section, Signal Corps, U. S. Army.

Among those who represented the motor industries were: Messrs. Charles H. Hanly, of the Curtiss Aeroplane and Motor Corporation; Charles Day, of the Standard Aero Company; W. D. Yenawine, of the Gyro Motor Company; William R. McCulla, of the Packard Motor Company; H. M. Crane and J. H. Barbazette, of the Wright Company; and G. H. Abel, of the Thomas Brothers Aeroplane Company. The Naval Consulting Board was represented by Messrs. H. L. Coffin and Elmer A. Sperry. The Sturtevant Aeroplane Company was also represented.

Other members of the Advisory Committee, experts and aeronautical engineers present were: Hon. Byron R. Newton, of the Treasury Department; Mr. Edward Souther, Engineering Advisor of the Signal Corps; Captain V. E. Clark, Signal Corps; and Lieutenants V. G. Child and W. A. Edwards, U. S. Navy.

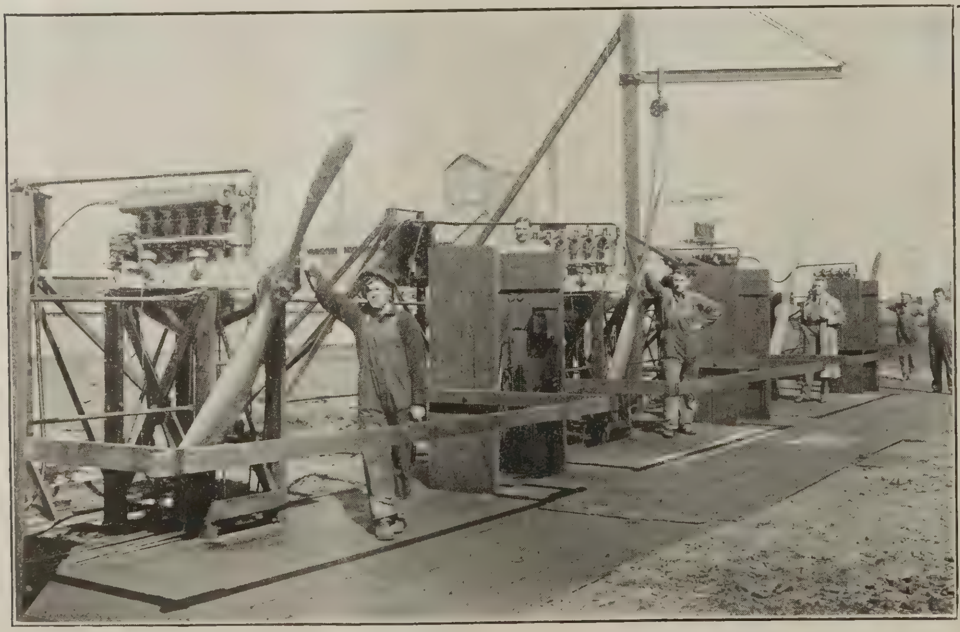
The chairman, who has been interested in aeronautics since the early experiments of Dr. Langley, said that co-operation between users of flying machines and the concerns manufacturing them must be effected before satisfactory results could be had. He called upon certain of the Government representatives to express themselves in regard to the needs of their particular branches of the service in connection with motors, and then upon several representatives of the manufacturing companies as to what they could supply.

Among the important points mentioned in the discussion which followed were the questions of standardization in requirements, materials, finished products, and tests of the same. Co-operation in all the above points was deemed necessary. Assurance that there would be a commercial field for aeronautic motors, making the extensive experiments necessary to the development of an efficient motor worth the consideration of the manufacturing companies, was brought out as an important factor.

As in the early days of automobile development, much work still remains to be accomplished, but the members of the committee and those invited to take part in the discussion seemed to feel, and several of them so expressed themselves, that America is not very far behind the European countries, and that she can catch up with their advance if co-operation is effected and a stimulus created. It was stated that the development of aircraft abroad has been greatly hastened by the stimulus of necessity.

The action of the committee in bringing together representatives of the manufacturers and users of aeronautic engines for frank discussion of the state of the art and the means of improvement is a long step forward, and the further meetings planned are looked forward to with considerable interest. The results of the meeting are considered very encouraging.

One proposition which will be worked out as rapidly as parcticable is to effect, through the Advisory Committee, the close co-operation of the manufacturers and the Government bureaus interested.



The outdoor testing stands of the Hall-Scott Co., at San Francisco, Cal.

FOREIGN NEWS

AUSTRIA

The following is the official Austrian report for June 9th:

"Our airmen bombarded the railway establishments at Portogruaro, Latisana and Palmanova (on the railway leading from Venice to the Isonzo front), the inner fort at Grado (on the upper Adriatic, near the mouth of the Isonzo) and enemy naval aeroplane stations and railway stations at Schio and Piovene (behind the Pasubio-Arsiero front).

DENMARK

At a meeting at Copenhagen on May 9th, of the Committee of the National Fund for providing fifty aeroplanes, under the patronage of Prince Axel, who is a pilot, it was decided to start business as soon as possible. The majority of the aeroplanes are to be manufactured in Denmark and partly in Sweden, and the remainder will probably be purchased in America. They are to be of the very latest design, and include different types from large biplanes to speedy monoplanes.

FRANCE

It is very interesting to compare the methods of air combat followed by the French and the Germans. Machines being equal, the most successful are the men who have not one method, but several, in meeting their adversaries.

"A German champion, like Immerman, the 'super-hawk,' over whom German papers wax so enthusiastic, has but one trick up his sleeve. He mounts as high as possible and turns round above his sector. Then when he catches sight of an adversary he lets himself fall upon him in a straight drop, and fires his machine gun as he passes. The fight is then over for him, whatever the result may have been. He makes off to his own lines and begins the same manœuvre over again.

"Navarre's way of fighting is altogether different. He harries his enemy from every side. He envelops him in unexpected evolutions. To prevent him from attacking, Navarre carries out the most fantastic leaps, swerves, and twistings, and then at the right minute pours in a stream of bullets from his machine gun. He has no special tactics, but a marvelous variety of attacks and feints. He never leaves an enemy until he has brought him down, unless some unforeseen circumstance intervenes. And Navarre is not alone, he has many a competitor in the service.

"The fighting aeroplane in the French squadrons is one seated, while the Germans almost always have two men in theirs.

"In an aeroplane the sense of hearing is useless, the din of the motor deafening both pilot and observer. Birds can detect an aeroplane by its sound from afar and display fear, but the human bird has to depend upon sight, and woe to the man who is taken by surprise! Speed and power of rapid ascent alone allow an unexpected attack to be made, a storm of bullets to be avoided or an enemy to be overtaken from behind.

"Aeroplane fighting is at close range, fifteen to twenty-five yards, if one wishes to make sure of hitting the mark with a quick firer. Of course there are exceptions. Navarre at Verdun, when at a height of 14,000 feet, saw a very fast German aeroplane escaping and fired at 200 yards distance, almost in scorn, not expecting to touch his enemy. But down came the German machine.

"Generally, however, Navarre tries to get as close as possible to fight. One day the wind was blowing a tempest from behind and a Fokker was fleeing before him. Twenty-five mile chase took less than ten minutes, Navarre keeping exactly in the wake of his foe, repeating every unforeseen move that he made.

"All the time the fleeing Fokker kept up a rearward fire from its mitrailleuse. Bullets whizzed around Navarre, but none touched him, his motor alone received a scratch or two. Then, when near enough, Navarre, who had not fired, opened with his machine gun and when twenty-five bullets had sped the German fell."

In reply to a request for his opinion regarding the well-known Fokker monoplanes, M. Bleriot, the aviation pioneer, replied: "It is a very greatly overrated machine, and no better than the aeroplane we have had in France for some time. I refer to the Morane-Saulnier. They have an engine, the Mercedes, which is as good but no better than the English and French engines. Never for a moment has Germany had the mastery of the air, and now that we have this new machine we have established a lead which will never be wrested from us." (The new machine referred to is the Spad, which has a speed in excess of 125 miles an hour.)

France has completely reorganized her air service, her "fifth arm," and the results are becoming more apparent every day. The so-called aviation crisis, which a few months ago brought about the resignation of the Under-Secretary of State who was in charge of that department, led to sudden feverish activity, out of which has come a new air service, with new methods of training, new methods of air fighting, a new class of airmen and even new types of air machines.

France here again has shown to the world a new example of her genius for creation and for organization in the very midst of the tremendous strain of fighting a war for the salvation, not merely of France, but of all the Allies, as Sir Edward Grey has so handsomely acknowledged.

The creation of the great mechanism which has made it possible for France to keep in the air over the battle field of Verdun a veritable swarm of aeroplanes, guided by pilots who are expert, intelligent and capable of exploits of high military importance, has been an achievement which adds a new lustre to the renown of that nation.

France once more has an assured supremacy in the air, and this is due, apart from the question of numbers, to the innate qualities of the French aviators. These aviators have in the highest degree the requisite gifts of the perfect pilot, suppleness, surety of the instinctive reflex motions, power of intellectual concentration, rapidity of decision, forgetfulness of danger and the indefinable quality which is manifested in the capacity for constantly improvising new expedients in the presence of the unforeseen.

On May 19th Lieut. Poulet made a new height record for pilot and two passengers by ascending to a height of 18,304 feet. He subsequently took three passengers up and attained a height of 19,226 feet. The previous records were: Lieut. Biers (Austria), pilot and two passengers, 17,815 feet, and Sabatling (German), pilot and three passengers, 17,224 feet.

"La Liberte" states that Kandulski, the aviator who brought down Pegoud, was killed by a young French aviator at Muelhausen.

American airmen in France continue to be very active despite unfavorable circumstances, including repeated bombardments of their camps by large squads of German aviators. These attacks are apparently directed against the Americans because the latter have been followed from one camp to another. On each occasion the Americans profited by the opportunity to attack the Germans over French territory and they were reasonably successful. The French aviators are using two styles of machines, one: the heavy machine built for enduring flights and bomb carrying and dropping; two: the small biplane, built to match the German machines in speed, carrying only the pilot, a machine gun and a minimum amount of combustibles. They do not rise gradually as do the larger machines but are capable of an ascensional power heretofore unattained. They have such a reputation with the enemy fliers that the pilot of one has to go into enemy territory to seek combat. The small machines are called the "Hunters."

GERMANY

Along the whole Russian front the Austro-German aviators have begun to use explosive bullets in their machine guns on their aeroplanes. German prisoners, when questioned upon the subject, said that orders had been given to all German aviators to fire explosive bullets in their aeroplane machine guns, because in striking gasoline tanks of aeroplanes they almost invariable cause an explosion.

Via Salonica and Paris comes a "suspect" report of the appearance on the Riga front of a new German battle-plane, which is said to be painted entirely black, of considerable size, with no resemblance to any known German type, and possessing a speed of 112 m.p.h. It is said to fly regardless of wind and weather and never at an altitude of less than 10,800 feet.

On May 25th German aeroplanes from the Salonica front dropped bombs over four allied warships in the Aegean Sea. Two bombs hit their mark according to an official German statement.

GREAT BRITAIN

New Regulations made under the Defense of the Realm Act and published on May 10th provide that "any person having found any bomb or projectile or any fragment thereof, or any article whatsoever which he believes or suspects to have been discharged, dropped or lost from any aircraft vessel of the enemy neglects forthwith to communicate the fact to a military post or to a police constable in the neighborhood, or on being so required neglects to send or deliver the same to the competent military authority or some person authorized by him for the purpose, he shall be guilty of an offence against these regulations."

A despatch from Maestricht, Holland, states that an allied air squadron has successfully bombarded the wharves at Hoboken, near Antwerp, where the Germans were said to be building destroyers.

Although fired on by German anti-aircraft guns all the aeroplanes returned in safety.

The story of the British navy's battle with the German fleet off Jutland is yet to be told. For obvious reasons it is not likely that the British tactics will be disclosed in the near future. In the meantime many diverse reports circulate, mere guesses being repeated as facts. However, correspondents have talked with enough airmen who flew over the shell-spouting ships during the fight to know something of its aerial phases.

From these and other sources it seems certain that besides being a naval victory it was a remarkable air victory for the British. Although the Zeppelins were not prevented from serving some good purposes for their fleet, they were partly prevented from carrying out their full programme. On the other hand, the British naval air service, using aero-hydroplanes, was not prevented from consummating the task assigned to it. The British navy lacked Zeppelins or similar dirigibles, which could be used for long distance scouting and the regulation of gunfire, but appreciating the importance of the enemy's aerial raid, provision was especially made to frustrate its work.

Though not succeeding in completely preventing the use of the Zeppelins as scouts radiographing back information to the hidden German fleet, the aero-hydroplanes did much to hinder them. The attempt to employ Zeppelins for fire regulation was met with extremely efficient work. Specially arranged guns manned by gunners trained to shoot at aerial targets opened an effective fire, and neutral reports show that two Zeppelins were practically destroyed and that another was damaged.

On the other hand, the far-seeing aerial eyes of the British fleet were not closed by the German anti-aircraft fire. Covering more area than the Zeppelins, a far less number of aero-hydroplanes operated from the parent ships, reporting enemy positions and the results of the gunfire.

ITALY

At the Mirafiori aerodrome, in Italy, on May 17th, Victor Louvet on a twin-engined military machine, with a passenger, succeeded in getting up to 20,460 feet, claimed as a new record for pilot and passenger. The previous record was that of Lieut. Biers, 6,170 metres.

A correspondent of the "Berlingske Tidende," who has visited the Austrian front reports that the Italian battleplanes are much superior to those of the Austrian's. The large battleplanes of the engineer Caproni are better than the other types. On the Izonso front there are 80 of these huge machine and the Austrians have not as yet succeeded in bringing down one of them.

RUSSIA

The following is the official Russian report for June 9th:

In the region of the Molodechno station an enemy aeroplane dropped four bombs. Five German aviators raided the town of Logichine, north of Pinsk, dropping fifty bombs. One of the machines was brought down by our artillery inside the German lines.

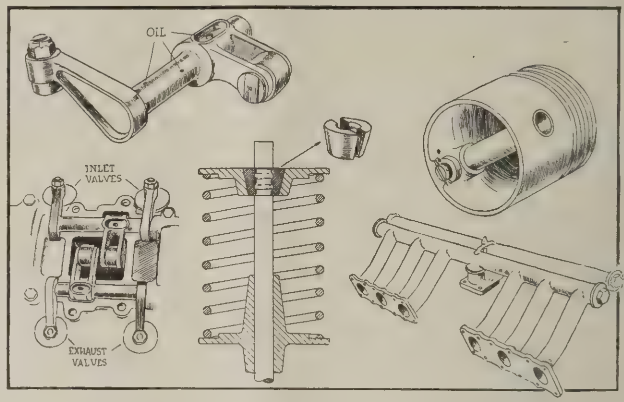
THE PACKARD AVIATION MOTOR

IT has been well known for some time that the Packard Motor Car Company have been developing a twelve-cylinder aviation motor. J. G. Vincent, engineering vice-president of the Packard Company, has several times stated publicly that all their experimental work led them to believe that there were advantages in the twelve-cylinder engine which made it the best type for endurance at high speed. The production of the 3 by 5-in. twin six, used in the Packard car, vindicated many of the theories since the twelve-cylinder engine showed itself the superior in almost every respect of carefully constructed experimental six-cylinder engines of the same total piston displacement.

Practically as soon as the success of the twin six stock motor was assured, designs were started for two other engines intended solely for aviation. One of these was designed to produce about 100 horsepower, and since this required approximately 300 cu. in., Mr. Vincent decided to limit the displacement to exactly this volume. Therefore the dimensions chosen for the small engine were 2 21/32 in. by 4½ in., and this is the size of engine with which the Packard Company is now making experiments. The large aviation motor which is under construction has a bore and stroke of 4 in. by 6 in., giving approximately 900 cu. in. piston displacement.

The small Packard aeroplane engine develops its requisite 100 horsepower at 2,300 r.p.m., and its weight is almost exactly 500 lbs. The 100 horsepower, however, is very considerably less than the total ability of the engine, which will run and show increasing power up to speeds in the neighborhood of 4,000 r.p.m. The power curve is quite smooth as the motor speeds fall off, and the engine will run quietly and regularly at 300 to 400 revolutions.

The design of the aviation engine is based upon that of the Packard automobile twin-six, but it differs very greatly in detail. The cylinders are cast in blocks of three and have four overhead valves apiece. Possibly it is in the operation of these overhead valves that the most striking engineering advance is to be found. There is, of course, an overhead camshaft to each set of cylinders. With a camshaft above the cylinders it has always been troublesome to find means for operating the valves without at the same time losing quantities of oil. If rockers are used there is always a slit in the side of the casing through which the rocker operates, and it is impossible to make this oil-tight. If the operation is direct, as in the Sunbeam, then there must be holes in the bottom of the casing through which the tappets pass to reach the valve stems. In the Packard design this trouble has been overcome by cranking the rockers. The lever which rests on the cam and the lever which touches the valve are at opposite ends of a short shaft. This means that the bearing

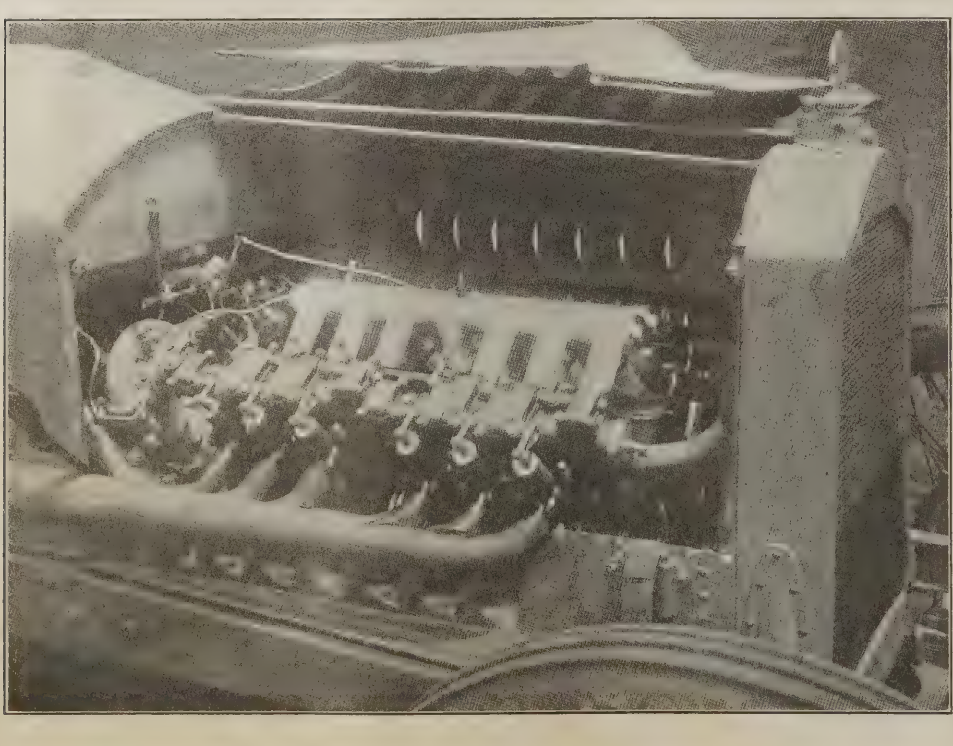


of the rocker comes between the cam end, which is in an oil box, and the valve end which is outside. The length of the bearing provides a perfect oil seal so that the cam mechanism can be lubricated copiously and yet the valves will remain perfectly clean. This layout can be readily understood by referring to the photograph of the motor.

Considerable thought was given to the best methods for driving the camshaft, and by making comparative layouts it was found that the balance of advantages favored the use of trains of spur gears. One of the most important advantages is that the parts of the spur gear trains are very simple and there are no thrust bearings required. Spur gears can be cut from very hard metal and finished very highly so that there is no error in the timing due to backlash.

For a variety of reasons the rear location is chosen for the spur gears, the crankshaft pinion coming just in front of the flywheel bearing. Owing to the high grade of material the gears are quite narrow, that on the flywheel being only ⅝ in. wide.

For the connecting rods the stock arrangement has been abandoned, and the forked type used instead of the side by side. The reason for this is that the former arrangement is lighter. With an L-head twelve-cylinder engine, if the valves are well proportioned, the length becomes such that there is plenty of room for side by side rods. With the overhead valve four-valve type of cylinder the length is so greatly reduced that there is not even room for forked rods, if the valves are taken as limiting factor. This, having commenced with the valves the engine was lengthened just enough to give



The 300 cu. in., twelve-cylinder, Packard aviation motor.

proper bearing surface for forked rods. These rods are made from very high-tensile steel of I-beam section and are machined all over; an oil tube carries the lubricant to the piston pin.

The crankshaft is very unusual as the webs are triangular in end elevation. This design was developed by experiments made to discover the design which would provide the greatest rigidity with the least weight. For both the main bearings, of which there are three, and the crank pins, the diameter is 1⅞ in., but the triangular webs are so strong that the shaft is completely free from whip throughout the whole speed range. It has already been stated that the connecting rods are very light, and this lightness extends to the pistons. These are die-cast aluminum alloy, and the whole piston assembly with four rings and piston pin complete weighs 11 oz.

It is when the valves are examined analytically that one of the advantages of the twelve-cylinder construction appears. In these little cylinders, 2 21/32 bore, there is room for four valves 1 7/16 in. in the clear. The angle of seat is 45 deg., and the lift 0.34 in. This gives 1 sq. in. of valve opening for each 17 cu. in. of piston displacement.

All Packard aviation engines will be supplied with starting and lighting equipment. For this purpose Delco has developed a special small generator design for the high average speed of aeroplane service. This is mounted accessibly between the cylinder blocks.

Aviation at the Brookside Theatre

In Miss Martha Leonard's little outdoor theatre, the Brookside, on her estate at Mt. Kisco, an entertainment was given on Saturday afternoon for the benefi,t of the Aero Club of America. The program included an address by Henry Woodhouse, one of the Governors of the Aero Club of America, in which he dwelt upon the urgent need in this country for more aeroplanes in our preparedness equipment, and said in closing:

"The average man finds that after he has had two years of military training he is worth about half a soldier. On the other hand, he finds that if he takes a course of training in aviation, at the end of six weeks, as soon as he can pilot his machine alone, he is worth 100 soldiers; at the end of six months, when he is able to fly across country and drop bombs, he is worth 500 soldiers; at the end of a year, when he is an expert pilot and has learned military tactics, he is worth 1,000 soldiers."

A one-act play by George Bernard Shaw entitled "Don Juan in Hades," and presented for the first time in America, proved to be a satire on religion. It was ably played by Robert Hamilton as Don Juan, Algernon Tassin as the Devil, Hooper Trask (courtesy of the Bandbox Players) as the Statue, and Miss Martia Leonard as Senorita Anna.

The program closed with folk and character dances given by Miss Elizabeth Gardiner, Miss Margaret Crawford, and Oliver Grymes.

Thomas Aeroplane Corporation Stock Offered

According to the Boston *Financial News*, Clarence C. Perpall & Co., of New York, are offering $300,000 7 per cent cumulative participating preferred stock of the Thomas Aeroplane Corporation at $100 per share, with a bonus of two shares of common with each share of preferred purchased.

The plants of the Thomas Corporation, which is being formed to take over either directly or by ownership of all the issued and outstanding stock the entire business of the Thomas Brothers Aeroplane Company, Inc., and the Thomas Aeromotor Company, Inc., are located at Ithaca, N. Y.

The new corporation is to have an authorized capitalization of $1,000,000 7 per cent cumulative participating preferred stock, of which $500,000 will be issued, and 30,000 shares of common stock without par value, all of which will be put out. There are to be no bonds, notes or other indebtedness.

The preferred stock will share with the common stock in any dividend paid after $10 per share has been distributed on the common in any year, and 20 per cent of the net earnings after payment of preferred dividends is to be set aside annually as a sinking fund to retire the preferred at $110 per share.

In a letter to Perpall & Co., William T. Thomas, president of the Thomas companies, estimates that on the basis of an annual production of 100 aeroplanes and 200 motors there will be a balance applicable to the common stock amounting to more than $12 a share.

Chicago News

Louis Gertson tried out his 90 horsepower Gyro tractor Sunday. His machine handles well and is a very efficient flyer, making several flights at altitudes of three to five thousand feet. The Champion Company is busy training every day that weather permits. The Partridge Company is making changes in its tractors and expects to resume flying activities immediately.

Miss Catherine Stinson has returned to the field after filling a date at South Bend, Ind., Saturday. Her exhibition consisted in her usual loop flights and upside down flying.

E. M. Laird is back after having filled a date at Lansing, Mich. The machine used was his own efficient little 45 horsepower tractor biplane.

Charley Niles has his looping monoplane here. It is being being overhauled and put in shape for exhibition work.

C. Sinclair has left for an extended exhibition tour with his Stupar tractor. This machine is powered with a 70 horsepower Maximotor.

The Chicago Aero Works on two new tractors and expect to have the machine out this week. One is equipped with a fifty Kirkam, and will be used by Mr. Couch for exhibition work. The other has a 100 horsepower motor and is a looping outfit to be piloted by Fred Hoover.

Messrs. Baysdoerfer and Kuhl have returned from a date at Celina, Ohio.

Burgess News

Members of the Aeronautical Squad of the Tenth Deck Company Massachusetts Naval Militia have been sworn in and are now a part of the regular organization of the Naval forces of the State. They are soon to be supplied with a machine by the Burgess Company and within the next few weeks the entire personnel will be trained as fliers.

The squad will be in charge of Norman Cabot as ensign, with George R. Fearing, Gordon Balch, Bayard Tuckerman and Clifford L. Webster as flying officers.

Mr. Webster is already an expert aviator and is the instructor in the Burgess Company School at the present time. Mr. Cabot and Mr. Fearing have also nearly reached the point to training where they are ready to take out their certificates, and when the new machine is ready Mr. Balch and Mr. Tuckerman will go through the same course.

For the use of the squad the Burgess Company has constructed a seaplane of the latest type, similar to that recently furnished to the New York Naval Militia. It is built on the Dunne design, which means that it is self-balancing, and is equipped with a Curtiss motor of 110 h.p., giving an air speed of approximately 70 miles an hour.

Meanwhile, the aeronautical squad of the Ninth Deck Company, whose headquarters will be at Newburyport, is already at work under command of Godfrey L. Cabot, a brother of Norman Cabot, who has been flying since last fall in a type somewhat like the new machine furnished the Tenth Deck Company.

The machine at present used by Godfrey Cabot is his own personal property, but will be used for training purposes from time to time by the Naval Militia.

In addition to this, a new machine is now under construction of the naval seaplane type, which will become the property of the New England Aero Club, and will be loaned to the Ninth Deck Company.

Still another seaplane for the use of the State Militia has been ordered by Eben S. Draper, of Hopedale, from the Burgess Company, and will be delivered within the next two months. This will give the State a total of four marine aeroplanes, all of up-to-date construction. The total equals that of the New York Naval Militia, which has hitherto been in the lead in aviation among the various States.

American Zeppelin Co. Incorporated in Delaware

Articles of incorporation have been filed at Dover, Del., for the American Zeppelin Company, with an authorized capital of $6,500,000. The company was organized for the purpose of manufacturing Zeppelins, aeroplanes and all machines or contrivances for navigating in the air. The attorneys for this company are Wesselman & Kraus, and it is said that banking interests are behind this enterprise. All efforts to obtain official information in regard to the proposed plans of the company were unsuccessful. The attorneys for the concern said they were not at liberty to make any statement for publication at this time.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
47 Churchill St., Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Aero Science Club of America

On June 18 the Aero Science Club will hold its contest for mechanical driven models and at the same time a contest for R. O. G. rubber strand driven models in connection with the National Model Aeroplane Competition. Both contests are to be held at the Garden City flying field and judges to represent the Aero Club of America have been requested to officiate. Those who will represent the club in the mechanical driven model contest are Messrs. Frank Schober, Fred Thiele, John McMahon, William Bamberger, Louis Bamberger and G. A. Cavanagh. Those who will fly in the R. O. G. rubber strand contest are Messrs. Frank Broomfield, Chas. W. Meyers, Egbert P. Lott, Wallace A. Lauder, Curtis Myers, A. K. Barker. The club is anxiously awaiting the result of both contests, particularly the mechanically driven model contest in so far as this contest will have been the first of its kind to have been held in America. It is believed that new American records for this type of model will be established inasmuch as those who will participate have had considerable experience in building and flying models of this type. The R. O. G. contest for rubber driven models will also afford an interesting event, for in this contest Wallace A. Lauder, former world's distance champion will attempt to break the R. O. G. duration record, using his record model equipped with a landing chassis.

Word was received from Mr. William P. Dean, former director of the Detroit Aero Research and Model Club to the effect that he is arranging the formation of an Aero and Research and Model Club in Toledo, Ohio, where he now resides. Mr. Dean is one of the most consistent workers in the field of model aviation, at one time having been one of the champion model flyers of England. After coming to this country he formed the Detroit Aero Research and Model Club, which club took part in the National Model Aeroplane Competition of 1915. He is also the writer of several articles pertaining to the construction of models, and especially bent wood propellers, which articles have appeared in both AERIAL AGE and *Flight*. The club wishes Mr. Dean success in his new undertaking.

The Buffalo Aero Science Club stated its intention of exhibiting models at the Aeronautical Exhibition to be held at Buffalo, New York, during the month of July and have kindly offered their best offices in the matter of exhibiting any models that the club may send. This has been given attention and a few models will probably be sent.

Mr. Ladis Gladki, who was recently elected a member, announced that he is building a model along the lines of the new Wright tractor biplane. The model, he said, has a spread of six feet and will, according to his present plans, be driven by a spring motor. The mechanism of the model makes it possible for the model to be used as either a single propeller tractor or a double propeller pusher.

If any young man in the neighborhood of New York City is desirous of entering the National Model Aeroplane Competition and will communicate with the Secretary, 29 West 39th Street, New York City, he will receive the necessary information.

The Buffalo Aero Science Club

A regular meeting was held, June 6, at which Mr. Willis L. Brumer, Mr. Eugene Pfeil and Mr. Emil Henrich were presented with their Aero Science Club of America certificates. The coming Aviation Meet was discussed, and Mr. Weyand, the president, appointed Mr. Alexanderson, Mr. J. W. Schreier, the secretary, and himself, as a committee to attend to the exhibition booth, at which models and model parts will exclusively be open to public inspection.

At a meeting of last October, Mr. Gellart forwarded a motion that the club build a glider. The motion was adopted and work on the glider was commenced. The glider, width twenty feet, length thirteen feet, chord four feet two inches, and gap four feet, is now completed, and will be used by the members at the flying ground, on Englewood avenue. Its design is entirely original with the club members, and is a biplane.

Persons interested, please communicate with the Secretary, Mr. J. W. Schreier, at No. 48 Dodge street.

Redwood Aviator Offers to Teach Boys to Fly

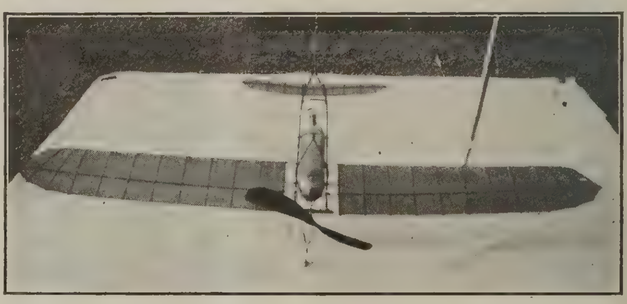
W. A. H. Kohler, an aeroplane builder of Redwood City, Calif., wants to teach the young idea how to fly, and will in the near future attempt to establish a course of aviation in the manual training schools of San Francisco.

It is Kohler's belief that an efficient air corps, to be used for protection in times of peace and for defense in times of war, can only be built up by instilling a thorough knowledge of the art of flying into the minds of the youth of the whole country.

Within two weeks he will approach the Board of Education in San Francisco and will lay the details of his plan before that body. Kohler will ask nothing for his services. Should the project meet with favor in San Francisco it will be put into operation later in Oakland and other important cities of the State. Kohler said:

"'My plan is to take boys of ten years and up. I would first teach them the principles of 'plane manufacturing and the theory of air currents, and finally would teach them to fly. The flying would be learned gradually by means of gliders and by the use of my compressed air motor 'plane. In the end the students would use a full-fledged gasoline machine of a non-capsizable kind.

"'This country must perfect its air squadron, and I believe there could be no better system than to start by educating boys in all parts of the country.'"



Type of compressed air driven model which will probably be used in the contest to be held at Garden City, June 18th. This model was constructed by Frank Schober, Aero Science Club.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Raised on 'Em

Officer (to applicant for aeronautical corps)—Do you know anything about flying machines?
Young Aviator—Yes, sir, I was raised on them.

Mechanic (to his friend)—Let's see, I owe you three dollars, don't I?
The Goat—I know it, but you needn't rub it in.

Pat and Mike were rushing the Germans. A bomb dropped from an aeroplane, exploded and made a large cavity in the ground. They both fell in and their simultaneous remarks were:
Pat—"Begorra I hope I get out of this hole."
Mike—"Not I, I hope I get out of this whole."

"I hate the sight of a barber," said the inventor.
"Why's that?"
"He not only smears you but he rubs it in."

"What did you say your age was?" he remarked, between flights.
"Well, I didn't say," smartly returned the girl, "but I've just reached twenty-one."
"Is that so?" he returned, consolingly. "What detained you?"—*Punch Bowl.*

Cimple—"Where can I find the write-up of the aviation meet?"
Cimpler—"In the fly-paper, most probably."

'19—"I came down on the spur of the moment . . ."
'17—"Gee, you must be sore."

Mechanic—I want some winter underwear.
Clerk—How long?
Mechanic—You boob, I don't want to rent 'em; I want to buy 'em.

Oh, These Feminists!

"Oh, say, who was here to see you last night?" inquired Mr. Highflyer.
"Only Myrtle, father."
"Well, tell Myrtle that she left her pipe on the piano."

Waitress (to aviator)—Will you have something in your coffee, sir?
Aviator—Yes, a little coffee.

An aeroplane shed which usually sheltered the aviator as well as the aeroplane, had just burned and during the course of operation the following was overheard:
"What started the fire, Mr. Fireman?"
"Fireless cooker, madam."

"Can't you run a little faster, James?"
"Shucks! dere's no pleasin' some women. I suppose if I was a race horse you'd complain because I couldn't fly."

Vernon Castle is safe. No matter where a bullet hits him, it will just graze him.

Pilot—What makes you so infernally thin?
Friend—Worry, old chap, worry.
Pilot—What on earth are you worrying about?
Friend—Getting thin.

The Newspaper Style

"He shot himself in the right temple, the bullet coming through the skull on Tuesday evening, dying the following morning at eight o'clock."

Never Again

"Why did you refuse Skidmore's invitation to go aeroplaning with him.
"I've had enough. The last time I went out with him he was arrested for landing on restricted property and borrowed ten dollars from me to pay his fine."

Unnecessary Exertion

Pullman Porter—Next stop is yo' station, sah. Shall I brush yo' off now?
No; it is not necessary. When the train stops, I'll step off.

Aviator—I can marry any girl I please.
Aviatrix—Yes, but whom do you please?

Before the Flight

Won ten bucks at poker last night.
(Surprised)—Honestly?
Now, don't ask any foolish questions.

WILL IT COME TO THIS?
"Drop the swag, Bill; it's Skylock Roams, the aero-plain-clothes man!"

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AERIAL AGE WEEKLY

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Aero Club of America's Energetic and Constructive Work to Get Substantial Air Service for Army, Navy and Militia

IN answer to the recent letter sent to Congressmen and Senators by the Executive Committee of the Aero Club of America, pointing out that the estimates for aeronautics for the Army and Navy included in the Army and Navy appropriation bills now being considered by the House and the Senate, were made many months ago, and are utterly inadequate to meet the conditions created by recent events and by the tremendous development that has taken place in aeronautics since then, a number of Congressmen and Senators have written to the Aero Club of America asking for information as to what should be done to develop our aerial defenses.

Many Senators and Congressmen state that they appreciate the value of air craft, and realize that our aerial defenses should be developed at all cost. As other nations have thousands of aeroplanes and aviators, the least that we can do this year is to take steps to provide a few hundred aeroplanes and aviators.

The cost of establishing substantial aeronautical organizations in the Army, Navy and Militia will be much less than it will cost to develop any other arm of the service, aeronautics being the one branch of the service which can be developed rapidly and economically. The last battle cruisers ordered cost $20,400,000 each. That amount of money spent in aeronautics would give the Army, Navy and Militia substantial aeronautical organizations, affording also a most effective system of aerial coast patrol.

Complying with the requests of the Congressmen and Senators, the Executive Committee of the Club has outlined the following plans, which, if carried out, will give fairly substantial aeronautical organizations to the Army, Navy and Militia and constitute a good step towards placing the United States in the safe position of the porcupine, which goes about its daily peaceful pursuits, harms no one, but is always ready to defend itself.

WHAT REMAINS TO BE DONE BY CONGRESS AND THE SENATE TO BUILD OUR AERIAL DEFENSES.

The things that still remain to be done to develop our aerial defenses are:

(1) The appropriation for army aviation should be increased from the $1,222,000 provided for in the present Army Appropriation Bill, which represents the estimates made many months ago, and are therefore inadequate, to $5,000,000, which is the amount required to organize, equip and maintain for one year five complete aero squadrons, including the cost of training army officers, pay of officers, civilian expert mechanics, etc. The cost of the equipment of one aero squadron in the field, ready for service on the first line, is $773,550, as shown on the accompanying estimates.

(2) The appropriation for training of National Guard officers should be increased from $76,000, asked under the old estimate, to $1,000,000—the sum required to train the 160 National Guard officers of the forty different States which are ready to be trained.

This sum would cover the cost of the aeroplanes and equipment needed to train the 160 National Guard officers, allowing the Army standard of the aeroplane in service and one aeroplane in reserve for every four students being trained. (See detailed estimate appended hereto.)

To this should be added the cost of establishing six aviation schools, building of hangars, machine shops, etc.

(3) The estimate for aeroplanes and equipment to be supplied by the Militia Division of the War Department to the National Guard of the forty States which are ready to organize aviation companies at present is less than one million dollars. It should be increased to at least $2,000,000. The smallest aero unit recognized by the War Department is an aero company, which must have four trained aviators, four aeroplanes in commission and two in reserve. It costs about $100,000 to organize, equip and maintain one aero company. Therefore it would require $2,000,000 to organize aero companies in the National Guard of twenty of the forty States which are ready to do so.

(4) The Army needs dirigible balloons and kite balloons, particularly for coast defense. It is not possible to estimate how much is needed, as that depends upon the types of craft to be acquired. But there should be made available about $2,000,000 to be used to provide dirigibles and kite balloons.

(5) Provision should be made whereby civilian expert aviators who can pass the Army tests may become part of an aerial reserve, which will be available in case of war, these aviators to be given a commission and be given a periodical course in military aeronautics at the Army aviation schools. As the Army is short of officers and men for the aviation section, many civilians may eventually enlist and become Army aviators. The sum of $1,000,000 should, therefore, be allowed for the organization of such a reserve.

NAVAL

(6) The sum of $3,000,000 should be allowed for dirigibles, kite balloons and stations. The recent naval battle in the North Sea has proven the value of dirigibles in warfare, as naval auxiliaries. The common use of kite balloons in the navies of all the warring countries has shown the need of kite ballons in the United States Navy. It is not possible to estimate exactly how much it would cost to build a large dirigible, but, whereas it would require besides dirigibles, two large stations with large hangars, hydrogen plants, and funds for general upkeep and experimentation, and as the cost of kite balloons is around $5,000 each, not including the cost of operation, there should be between $2,000,000 and $3,000,000 allowed for dirigibiles and kite balloons, not including the cost of grounds and buildings for the stations.

(7) Provision should be made for establishing a chain of aerial coast patrol stations. The aerial coast patrol consists of aero radio stations established at every one hundred miles along the coast, and would make a most valuable and economical system of coast defense. There should be allowed $1,000,000 for establishing the chain of aerial defense coast stations, to be operated either by the Navy or by the Naval Militia, in co-operation with the Coast Guard or separately.

Who Is Responsible?

"WHO is responsible for the fact that there is not even a complete aero squadron with the Mexican expedition, and no provision had been made for training additional Army aviators to organize the four aero squadrons which are absolutely necessary for the Mexican campaign?" is the query put by President Alan R. Hawley of the Aero Club of America for President Wilson to answer.

Although it was pointed out over three months ago, when Villa raided Columbus, that the punitive expedition would need at least four complete aero squadrons, with an allowance of three aeroplanes to each aviator, the same as is allowed in European countries, there are only sufficient machines for one-third of one squadron. On account of the lack of funds, it was only possible to order three more machines for the Mexican expedition, so that the conditions

today are that although the entire mobile Army of the United States, and the Coast Artillery, which is being used as infantry, in Mexico, are facing an ugly situation and the air service is badly needed to protect both the Army and the people living along the Mexican border from Mexican raids, the air service is practically powerless. There are only twelve aeroplanes at the border with the punitive expedition, and three more contracted for, so that, allowing three aeroplanes for each aviator, which is the number allowed by European countries, there is really only sufficient equipment for five of the fifteen aviators who are now with the expedition.

The recent report of an order for 20 aeroplanes being placed was a tentative matter, as the funds were not sufficient to place an order for more than three aeroplanes, and the other seventeen, which are badly needed, cannot be purchased until Congress makes the necessary appropriation.

Mr. Hawley's communication to President Wilson follows: "Dear Mr. President:

"We beg to submit for four attention the following pitiful conditions of the U. S. Army air service, and to urge your consideration of this very important subject before it is too late.

(1) "Although it is three months since Villa's raid on Columbus brought out strongly the necessity of organizing and equipping at least four aero squadrons to meet an emergency, today we find that there are only twelve aeroplanes and fifteen aviators with the punitive expedition, and the funds were exhausted some time ago, when the last order for three aeroplanes was placed.

(2) "Therefore, although the entire mobile Army of the United States and the Coast Artillery, which is being used as infantry in Mexico, are facing an ugly situation and the air service is badly needed to protect both the Army and the people living along the Mexican border from Mexican raids, the air service is practically powerless.

(3) "As it costs $773,550 to organize, equip and maintain an aero squadron keeping twelve aeroplanes always ready on the first line, with the necessary number of motor trucks, hangars and other equipment, the $500,000 emergency appropriation allowed by Congress three months ago was not sufficient to organize even a sufficient aero squadron. Therefore, it was not possible to establish and equip an Army aviation school and buy aeroplanes for training additional Army fliers.

(4) "As a result or this failure to make adequate provision for the organization of four aero squadrons, today over three months after Villa's raid on Columbus, we find the bulk of the U. S. Army face to face with a grave situation, unable to cope with conditions which could easily be met if there were fifty well equipped aviators with General Funston.

"As a matter of fact, Villa's raids might never have taken place if the Mexican border had been properly patrolled by aerial patrols. Had we fifty well equipped aviators, Villa and his bandits would quickly have been rounded up. An aeroplane is worth a thousand soldiers in such a campaign.

"After Villa's bandits repeatedly made raids on United States soil, murdering American citizens and destroying American property, then, surely, we had had a costly lesson, and the least that could be done was to take steps to prevent a repetition. But this was not done. So we had repeated raids, more of our citizens murdered, more property destroyed; and today practically all of our mobile Army is facing an ugly situation, with only a few aeroplanes at hand.

(5) "The Aero Club of America has received communications from Congressmen, who point out that Congress is not to blame for these conditions, as that body is willing to give the War Department whatever is needed to provide adequate national defense. It has been pointed out that Secretary Baker stated to Congress that he considered $1,000,000 a sufficient sum for aeronautics for the Army for the coming year, notwithstanding the fact that Secretary Garrison had conservatively estimated that it would take at least $4,000,000. Undoubtedly Secretary Baker, not being familiar with the Army's needs, failed to consider that aeroplanes are consumable products, and it costs $773,550 to organize, equip and maintain one squadron, to have 12 aeroplanes ready for service on the first line. This would bring the cost of organizing four aero squadrons up to $3,094,200. Adding the cost of establishing aviation schools for training Army aviators, the need was for not less than $5,000,000 to supply sufficient aeronautical equipment to meet the Mexican situation.

(6) "Considering that, as Earl Kitchener stated, "An aviator is worth an Army corps," and further, that had we promptly sent such equipment to the border, the history of the Mexican trouble might read quite differently, and conditions might never have become so ugly, we submit that the investment of $5,000,000 for aeronautical equipment would have been an economical measure.

(7) "Prompt action is now necessary. The War Department can within a month, with the cooperation of the National Guard, aeroplane manufacturers and Aero Clubs. establish nine Army aviation schools and begin training the Army and National Guardsmen who are ready to begin training. From this number can be quickly produced 100 good flyers and 100 good observers.

(8) "At the present time the Army has not a single permanent aviation school, no steps having as yet been taken to acquire North Island, at San Diego, where the Army aviation schools has been temporarily located.

"Aviation schools can be established and put in operation within a month at North Island, and Newport Beach, Cal.; Atlanta, Ga.; Newport News, Va.; College Park, Md.; Garden City, L. I.; Ithaca and Buffalo, New York; San Antonio, Texas; Chicago, Ill.; and Squantum, Mass. These places have suitable grounds for aviation schools and temporary arrangements can be made which will permit beginning training almost immediately, while further arrangements are being made to select the most suitable places for establishing permanent schools.

(9) "The heads of the National Guard of forty States have advised the Aero Club of America that they have a large number of applications from Guardsmen who are anxious to take up aviation.

"It is known that the Army has a substantial waiting list of Army officers who desire to take up aviation, and are waiting for machines with which to train them.

(10) "The Army has only thirty trained aviators at the present time, including fourteen at the Mexican border; five in the Philippines; 3 at San Diego School; 2 on inspection duty; 3 in the Army Hospital and 2 on sick leave. Eight more Army officers are expected to qualify within the next month, so that it would be possible to get nine Army fliers to put in charge of the nine proposed schools, employing expert civilian aviators to assist in teaching.

(11) "Thirty of the National Guard officers who are being trained in aviation at the expense of the National Aeroplane Fund of the Aero Club of America should be promptly sent to the Army aviation schools to complete their training under the supervision of the Army fliers, so that they can become available for service in a short time.

To carry out this program and organize the four aero corps needed for the Mexican campaign, there should be appropriated about $5,000,000 for the schools and the aeroplanes for training and $3,094,200 for the equipment of the four aero squadrons.

"Assuring you that the Aero Club of America and its thirty affiliated Aero Clubs stand ready to cooperate in every way possible to meet this grave situation, we remain.

"Respectfully,
Alan R. Hawley, Chairman,
Executive Committee, Aero Club of America."

The Twin-Motored J. N. for the Army

THE twin motored 160 horsepower battleplane, which was presented by the Aero Club of America to the New Mexico National Guard recently, and which flew from Newport News to New York and then carried President Alan R. Hawley from New York to Washington, is being taken over by the Army to be operated by an Army officer. Being advised by Adjutant-General Harry T. Herring, of the New Mexico National Guard, that the Army had offered to buy this battleplane, Mr. Alan R. Hawley, president of the Aero Club of America, sent the following telegram to Secretary Baker:

Hon. Newton D. Baker,
Secretary of War,
Washington, D. C.

"The Aero Club of America having been advised by Adjutant-General Harry T. Herring, of the New Mexico National Guard, that the Army has offered to buy the twin motored 160 horsepower battleplane which was recently presented to the New Mexico National Guard, and which is now at Columbus, New Mexico, has advised General Herring to accept the offer. This battleplane completed its tests at Columbus a few days ago flying three thousand feet in eight minutes with full load and nine thousand feet in thirty minutes. As the start was made at an elevation of four thousand feet, these flights show that this battleplane is exceptionally efficient.

(*Continued on page* 459)

The News of the Week

Aeroplane on Senate Lawn Is Object Lesson

In conjunction with Rear Admiral Robert E. Peary and the National Aerial Coast Patrol Commission, of which he is the head, the Aero Club of America and the *N. Y. World* exhibited on June 19 on the lawn of the United States Senate Office Building a big military tractor aeroplane.

It was to serve as an object lesson of the sort of machine of which the Army stands in need to do effective work in war time, providing a silent argument in favor of the increase in the Army appropriation for aviation purposes, decried by experts as pitiably small.

Senator Lee S. Overman, of North Carolina, chairman of the Senate Committee on Rules, and Col. Elliott Woods, superintendent of the Capitol Grounds, joined in granting courteous permission for the exhibition.

The presence of the war machine came as a genuine surprise to the majority of the Senators. The tractor aeroplane had been assembled during the night, a big task, and accomplished before daylight under the direction of Lieut. Ripley Bowman, Flying Corps, New York National Guard, and Capt. Ralph L. Taylor, of the Connecticut National Guard, who has just finished a course at the Curtiss Flying School at Newport News, Va.

While they were setting the war aeroplane up, telegrams came to both the young officers of the President's call for the Guard of the States, and both were whisked downtown in taxicabs and reported to New York and New Haven over long distance telephones.

The big fighting aircraft exhibited yesterday is a Curtiss J N, the same type as the machine with which Carlstrom flew from Newport News to New York and from New York to Washington, and which is now doing patrol duty on the Mexico border. It is especially equipped with pontoons, and Rear Admiral Peary was interested in emphasizing this feature, for the pontoons fit the aeroplane for use as a life-saving instrument as well as for military coast patrol.

Baby Scout in Preparedness Parade

One of the spectacular features of the Washington Preparedness Parade last week was furnished by the aeronautical unit. It took twelve motor cars to transport this unit, which included one of the new Curtiss baby scout machines, which can attain a speed of 105 miles an hour.

On each of the floats of this section signs were displayed giving starting data on the unpreparedness of the United States in the aerial branch of its military organization.

The unit was contributed by the National Aerial Coast Patrol Commission, of which Rear Admiral Robert E. Peary, U .S. N., retired, is chairman.

The baby scout aeroplane was mounted on a high truck, drawn by four gayly decorated horses. With the machine was Ripley Bowman, of the Aero Club of America, and four buglers who gave military calls along the line of marsh.

Some of the big signs on both sides of the eleven floats were very effective. For instance:

"One aviator and aeroplane to-day are worth 4,000 soldiers." —Kitchener.

"Germany, France and England now have 9,000 aeroplanes each; the United States has less than 100; Bulgaria, the size of Rhode Island, has 300. Nuff Sed!"

"Aeroplanes are life-savers, not life-wasters."

"There will be aerial fire departments, ambulances and passenger, freight and mail cars within twenty-five years."

Members of the commission which arranged this unique demonstration are: Rear Admiral Robert E. Peary, chairman; Senator Charles F. Johnson, of Maine; Senator Morris Sheppard, of Texas; Representative Julius Kahn, of California; Representative Charles Lieb, of Indiana; Byron R. Newton, assistant secretary of the treasury; William W. Ingraham, assistant secretary of war; Dr. E. Lester Jones, superintendent of the United States Coast and Geodetic Survey; Prof. H. C. Frankenfield, chief forecaster of the United States Weather Bureau; Hon. Emerson McMillin, of New York; John Hays Hammond, Jr., and Earl Hamilton Smith, secretary.

New York to Have Flying Yacht Club

New York is to have something new—The New York Flying Yacht Club, the first of its kind in the world. The club's sponsors are Bud Mars, the well-known aviator, and Augustus Post, holder of the world's long-distance balloon record.

It is proposed to locate the new club on the stretch of filled-in land, now vacant, along the Hudson River extending south from the Recreation Pier at West One Hundred and Twenty-ninth street to the Columbia University boathouse. A magnificent clubhouse will be built. There will be three hangars at first.

Mr. Post explained what a wide scope the organization will have. He mentioned some of the prospective members as being Harry Payne Whitney, Vincent Astor and Harold F. McCormick.

The basic object of the club will be to develop "travel in the air," according to Mr. Post.

Export of Aeroplanes

During the week of June 11th aeroplane parts were exported to Sweden to the extent of $2,300.

Club to Furnish Hydroaeroplane for Massachusetts Militia

The hydroaeroplane which the Aero Club of New England is to purchase and present to the State for the use of the militia has now been ordered and will probably be ready about July 1.

The club is moved to make this gift not only to increase the interest in aeronautics but to help the general movement for national preparedness.

In pointing out the need of more military aircraft, Godfrey L. Cabot, president of the club, said that defense in the air is still the weakest link in the chain of national protection, and that there are not two per cent. as many flying machines or as many trained aviators in the service of the United States as France or Germany had at the beginning of the war.

A party of people who visited the Hempstead Plains field at 5 a. m. —before going to bed— snapped in front of one of the machines being made ready for training New York National Guard officers.

N. Y. National Guard Air Squadron Ready

Nurtured by the Aero Club of America and private contributions, New York State stands ready to put at the service of the nation an aero squadron consisting of six observation aeroplanes and forty men, of whom twelve could immediately qualify as practiced flyers and as many more as full fledged military observers.

The President's call found the aero squadron in course of completion. It has not yet been mustered into the National Guard, but this was to have happened in a few days and the squadron was to have joined the mobilization at the Beekman Camp. It will probably do so in a few days.

The squadron has a remarkable personnel. Its acting lieutenant commanding is R. C. Bolling, in private life chief counsel for the United States Steel Corporation. Its acting first lieutenant is James R. Miller, vice-president of the Columbia Trust Company. Among its members are a nephew of former Governor Odell, and Alexander Blair Thaw, a brother of William Thaw, who has distinguished himself as a member of the Franco-American Flying Corps on the European battle fronts. Philip J. Roosevelt and Norbert Carolin are others of the squadron.

Thomas Company to Train Militia Aviators

An offer to train three aviators free of charge has been received by the Aero Club of America from the Thomas Brothers Aeroplane Company. As the Aero Club has been flooded with applications from the National Guard of practically every one of the forty-eight States, and from civilians who are anxious to take a course in aviation, this offer of the Thomas Company was very welcome.

Following the policy of giving preference to those who asked first, the Executive Committee of the Aero Club selected three officers whose applications were received several months ago. Lieut. Anthony Sunderland, First Lieutenant Connecticut Coast Artillery Corps, and Mayor of Danbury, Conn., was the first to take advantage of the Thomas Company's offer, and is now training at the Thomas School at Ithaca. Lieut. H. F. Wakefield, of the Vermont National Guard, and Lieut. Keeling R. Pulliam, of the Kentucky National Guard, have been offered the two remaining Thomas scholarships. In the event of the Mexican situation preventing any of these officers from taking the course, the scholarships will be granted to Corporal Chas. T. Robins, of the Arkansas National Guard, and Lieut. W. E. Lewis, of the Illinois National Guard.

The applications from men who wish to learn to fly are flooding the Aero Club. They come from every walk of life—all of whom have one desire, to learn to fly so as to be of maximum service to this country in case of trouble.

Iowa Youths Anxious to Fly

Over twenty young men have applied to Adjutant-General Guy E. Logan for instruction in aviation, so that if war comes they can join the fliers' corps in war. At present there is no way to give instruction for the Iowa National Guard has no aeroplanes. In the meantime it is possible some arrangement will be made to have the anxious would-be aviators instructed at the Grinnell school or at some of the army schools.

To Patrol Forests with Naval Planes

Hydroaeroplanes of the United States navy will be used by the Minnesota forestry department for patrolling the reserves in the northern part of the state, according to an announcement made last night by William T. Cox, state forester.

"The plan by which use of government hydroaeroplanes can be made by the forestry department of the state is not a new one," Mr. Cox said. "We have been corresponding with the Navy department since before the war started, and there is reason to believe our plan will go through since the bill providing for more planes has been passed."

Mr. Cox has inspected hydroaeroplanes used by the Wisconsin state forestry department and was much pleased with the plan in spotting and notifying wardens of fires.

It is planned to obtain planes of this description for use in the Minnesota forestry department.

Princeton to Have Aviation Squad

President Hibben has announced that Princeton will have two more additions next year to the corps of university aids to preparedness. He said that opportunity had been afforded for an aeroplane brigade, and that the machines and the instructors had been offered to the university through the efforts of alumni. The other organization is to be a motor cycle machine gun battery, plans for which had been drawn up by interested alumni. It will be in operation next term.

Personal Paragraphs

John Barry, San Francisco aviator, and one time mechanician for Art Smith, has gone to San Diego to enlist at the aviation school.

It is expected that De Lloyd Thompson will be in shape to fill engagements in Butte, Mont., July 3rd and 4th. He is recovering rapidly from the injuries sustained in his recent accident.

Mr. William Earl Dodge, the noted yachtsman, has received deliveries of his new Curtiss flying boat at Newport, R. I., where he expects to use it this summer.

Farnum T. Fish, the aviator of Lynn, Mass., was present at the dedication exercises of the Massachusetts Institute of Technology. On June 11th and 12th he made flights in Lynn, the flights on June 11th being in the rain.

Max A. Herbert, of Montclair, N. J., has designed a dirigible airship of the Zeppelin type which he hopes to see constructed by the United States government.

The features which Herbert says make it of special value are airtight compartments stretching the entire length of the body to render the airship unsinkable in case of a fall into water, a new bomb-dropping device and sectional construction by means of which the craft can be lengthened or shortened as desired. Four electric motors drive the eight propellers and the body is lighted throughout by electricity.

E. C. Christy, of San Francisco, will give exhibitons at Maricopa, Cal., July 2, 3 and 4. Mrs. B. M. Young, proprietor and manager of the hotel at Keuka on Lake Keuka, has become an expert aviator and was the first woman on the lake to pilot a hydroaeroplane. She has already driven with passengers on several short trips over the lake and the surrounding country.

The Glenn L. Martin tractor biplane of the type used by the Army Aviation Department at San Diego, Cal.

Aero Club for Vermont

Major Wallace Batchelder, who has just become interested in aeronautics and is going to organize the Aero Club of Vermont, has made a ten-strike in securing the presence in this state of Admiral Robert E. Peary at the time the organization is formally launched.

French Aeroplane Trophies at the Allied Bazaar

The French Army section of the Allied Bazaar at Grand Central Palace exhibited three captured German aeroplanes, a French scout aeroplane, three motors taken from fallen aeroplanes in the war, aeroplane bombs, darts and other aerial devices and equipment used by the fighting forces in this branch of the service.

The war exhibit was in charge of Marquis de Polignac, representing the French Government, and arranged by the direction of Messrs. Tanty, Lloyd Warren and Clyde Pratt of the War Relief Association, 40 Wall Street, New York. The exhibit was attended by an exceptionally large number of visitors who recognized this as a rare opportunity of seeing European War machines, brought directly from France.

Two of the German machines, which were marked with the familiar black maltese cross of the German Army, were suspended from the ceiling in the center of the building. One of these was an early L. V. G. biplane, 100 h.p., Mercedes engine, used extensively in the early part of the war. Its elaborate three-wheel chassis made it easy to land on bad ground, and it was considered a good all-around machine. Improved types of the same machine are largely used by the Germans and are generally mistaken for Albatross or Aviatiks, much as all German machines are called "Taubes."

The other machine was a three seater "battle plane," a powerful biplane which has done considerable execution in aerial flights. Fitted with machine guns firing both fore and aft, and possessing superior speed to the majority of the Allied aeroplanes, it one time dominated the air over certain sections of the fighting line. In these machines four vertical tubes extend through the fuselage, with machanism for holding bombs to be released by an observer.

Another German machine at the French War Booth, a twin motored hydroaeroplane with two long floats, was badly damaged, showing the effect of shell fire on the armored nacelle and motor shields, which were pierced and badly battered.

One French machine was exhibited; a Nieuport "scout," a speedy machine with small wing surface. The center panel of the upper plane is sometimes replaced with one provided with a circular opening so a gun can be fired up through the plane, an extremely useful feature as it enables the pilot to attack enemy aircraft from below, their most vulnerable and undefendable part, as few machines can fire vertically downwards.

The le Rohne motor used by Pegoud when his machine was brought down by an enemy aeroplane, was on view, decked with flowers commemorating the anniversary of his death. The other motors shown were a 220 h.p. Renault from a French aeroplane, and a German 160 h.p. Benz motor. Both were from aeroplanes to which an accident had occurred, and were badly smashed, each fused into an almost solid mass, apparently having caught fire.

Chicago News

By A. E. Nealy

The Champion Aeronautic Co. has shipped its big Sturtevant motored school tractor away for a short time. This machine had been flying regularly at the field. Mr. Kastory, the pilot, may fill a few dates with the tractor later in the year.

Mr. Dan Keiser flew the 65 h.p. Smith-motored Curtiss machine last week. Mr. Keiser was making straightaways when he happened to come down in a wet part of the field (it had been raining heavily) and dug the two wheels into the soft ground, causing the machine to nose over and smash.

The Laird looping tractor biplane has been flying every day during the week.

The Hartman Curtiss has been flying some during the week. This machine is motored with a Hall-Scott.

Promoter Marks' looping Curtiss, a machine that is an exact copy of the late Lincoln Beachey's Curtiss, has been shipped from the field to fill exhibition dates. The looper is flown by Louis Geurtson.

The Shank military tractor is now out with an exhibition company, flown by Sinclair. The machine has made a large number of flights.

The Partridge Company is now out with two machines and has been flying every good day.

Burgess News

The work of the Burgess School at Marblehead, Mass., has increased notably during the past two weeks, with half a dozen pupils hard at work. Among those receiving instruction have been Mr. Godfrey L. Cabot, Mr. Norman Cabot, Mr. George R. Fearing, Mr. Frank Korman, Mr. Norman Albree, Mr. Francis De Giers and Mr. John McGrath, who is to be a driver for Godfrey L. Cabot.

One of the features of the Massachusetts Institute of Technology celebration during the week of June 12 was the flight of Godfrey L. Cabot and Aviator Clifford L. Webster, of the Burgess Company, over Nantasket during the big reunion of graduates. The seaplane left Marblehead at 3.10 on the afternoon of June 13 and flew directly across the bay to Nantasket Beach, twenty miles away, returning and completing the round trip of forty miles in thirty-five minutes.

Later on the same day Mr. Cabot and Aviator Webster flew from Marblehead to Cambridge, where they circled over the new Technology buildings during the exercises and dropped cards urging support for an adequate aerial defense for the United States. The return was made at 5.30 after a flight of just under forty minutes.

May 7 marked the beginning of aviation in earnest in Seattle, Wash. Acting Mayor A. F. Haas smashed a bottle of grape juice over the bows of Aviator Mahoney's flying boat, dedicating it to the State. In the afternoon Aviator Herbert Munter made several flights in his biplane.

Fred Roberts recently saved his life by leaping from his aeroplane while one hundred and fifty feet in the air. His machine became unmanageable and Roberts jumped, landing uninjured in a freshly plowed field.

The Model L Tractor Wright Biplane at the Garden City Aerodrome.

THE AERIAL DERBY

AMONG the many prominent men in the Government service glad to indorse the National Aerial Derby for the Pulitzer Trophy, under the auspices of the Aero Club, scheduled to take place Sept. 2, is Col. George O. Squier, U. S. A., for four years Military Attache at Court of St. James, and recently recalled to command the aviation branch of the army.

"I would like," said Col. Squier, "to see the National Aerial Derby do for aeronautics what the big automobile cup races have accomplished for the automobile industry. The Aero Club and Mr. Pulitzer certainly may count on the fullest measure of support that I am able to give them in this splendid plan."

Many communications have been received from aeroplane manufacturers praising the idea of the Pulitzer trophy and announcing the intention to put machines into the Derby.

The New Jersey Aeroplane Company of Paterson, N. J., telegraphed to *The World*:

"We are heartily in accord with any movement to awaken public interest in a subject so vital to the State as aviation, which is unquestionably one of the most potent factors in modern warfare and which cannot fail to prove of increasing importance in times of peace."

Cecil Huppers, President of the New York Aero Construction Company of this city, wrote:

"I noticed in yesterday's issue of your paper that you are advocating an aeroplane race from here to the Pacific Coast. In that respect, I beg to state that the New York Aero Construction Company will undoubtedly enter two tractor aeroplanes equipped with twin engines developing 180 horsepower and having a flying radius of ten hours."

Other messages follow:

Walter Edward Kittel, President Federal Aircraft and Motor Corporation—The Federal will enter at least two machines, and I hope to pilot one of these in person. Consider the transcontinental race one of the biggest boosts given the aviation preparedness movement, and it is the first real effort to stimulate interest in the flying game, in so far as American sportsmen are concerned.

George S. Lacey, President Empire State Aircraft Co.—The proposed transcontinental aeroplane competition, as described in the New York *World*, and indorsed by the Aero Club of America, will certainly have our hearty co-operation and we believe it is a move in the right direction. Flights, such as are required in this competition, will do more to interest the public generally and convince our representatives at Washington that aircraft have progressed beyond the experimental stage, and are an important part of our national defense, than any number of trick or "loop-the-loop" flights; the aim being, as we see it, to demonstrate point to point flying which, in the final analysis, is the most important feature of aerial navigation.

H. S. Renton, President Chicago Aero Works—We think *The World* is doing a mighty big, fine thing and patriotic service to the Nation in re the transcontinental flight.

The General Aeronautic Company of New York—We certainly commend you for the interest you are taking in this matter. We contemplate entering one and possibly two machines of our standard military tractor biplane type.

The Transcontinental Contest

(Under the rules of the Aero Club of America and the Federation Aeronautique Internationale)

REGULATIONS

1. DATE OF CONTEST: The Contest will commence on Saturday, September 2d, 1916, at 1 p. m., and will finish at latest Saturday, September 30th, 1916, at 7.30 p. m.

2. QUALIFICATIONS OF COMPETITORS: The Contest is open to competitors of any nationality holding an aviator's certificate issued by the International Aeronautical Federation, and the Aero Club of America's yearly license, and to the militia, aero clubs, cities and any other organizations wishing to participate and can enter a properly equipped aircraft and a licensed aviator.

3. ENTRIES: The entrance fee is $200 and entries will be received up to 12 noon, August 1st, 1916. The entrance fee of $200 is payable either in one sum or as follows:

$100 by 12 noon on August 1st.
$100 by 12 noon on August 15th.

Late entries will be received up to 12 noon, August 25th, 1916, in which case the entry fee will be $500.

The entry form, which must be accompanied by the entry fee, must be sent in to the Secretary, Aero Club of America, 297 Madison Avenue, New York City.

TENTATIVE ROUTES FOR THE TRANSCONTINENTAL AEROPLANE CONTEST

Two tentative routes are being considered, with controls where aviators stop for twelve hours, as follows:

LINCOLN HIGHWAY ROUTE:

1. New York.
2. Washington to Baltimore.
3. Pittsburg (Penn.) or Dayton (Ohio) or Columbus (Ohio).
4. If Pittsburg is selected, either Fort Wayne, Columbus, Sandusky or Toledo may be selected as the next control. If Columbus or Dayton is selected, there may be arranged a control at either Fort Wayne or Indianapolis.
5. Chicago.
6. St. Louis.
7. Kansas City or Topeka or Lincoln (Neb.) or Omaha.
8. Gothenburg or North Platte (Wyoming).
9. Cheyenne or Lamarie (Wyoming).
10. Green River or Rock Springs (Wyoming).
11. Salt Lake City or Ogden (Utah).
12. Eureka or Ely (Nevada).
13. Carson City or Reno (Nevada).
14. San Francisco.

This route may be extended to Los Angeles and San Diego.

There are about twenty-five large cities and two hundred towns along this route, many of which are showing much interest, and may offer prizes to induce the aviators to land, or fly over a given section of the community.

SOUTHERN ROUTE

1. New York.
2. Washington or Baltimore.
3. Pittsburgh (Penn.) or Dayton (Ohio) or Columbus (Ohio).
4. If Pittsburgh is selected, either Fort Wayne, Columbus, Sandusky or Toledo may be selected as the next control. If Columbus or Dayton is selected, there may be arranged a control at either Fort Wayne or Indianapolis.
5. Chicago.
6. St. Louis.
7. Kansas City or Topeka or Lincoln (Nebr.) or Omaha.

(From this point either of these routes may be followed)

8. Muskogee (Okla.).	8. Wichita (Kansas).
9. Dallas (Texas).	9. Liberal (Kansas).
10. Waco (Texas).	10. Dalhart (Texas).
11. San Antonio (Texas).	11. Torrance (New Mexico).
12. Del Rio (Texas).	12. El Paso (Texas).
13. Marathon (Texas).	13. Hachita or Bisbee (Arizona).
14. El Paso (Texas).	14. Maricopa (Arizona).
15. Tucson (Arizona).	15. Yuma (Arizona).
16. Yuma (Arizona).	16. Niland (California).
17. San Diego or Los Angeles.	17. Los Angeles.

Either route may be extended to San Francisco.

The greatest distance between controls up to Kansas City will not be more than 350 miles. From Kansas City in desert and mountainous countries the distance between controls will be limtied to between 175 and 275 miles.

The Contest Committee proposes this limitation for the following reasons:

(a) To prevent excessive flying, making it possible to every aviator to fly in this initial long-distance contest with safety and to approximate ordinary conditions to be met in everyday practice, in aerial training, carrying mail, passenger carrying, etc.

(b) To give a larger number of controls and enable the population of important centers in different parts of the country to see the competing aeroplanes and become familiar with the present possibilities of aerial transportation.

(c) To hold the contestants together as far as possible.

(4) Compulsory Resting Time—Each competitor must expend a minimum aggregate of 12 hours while his machine is on the ground in the controls. These periods of 12 hours shall be called "resting time." No competitor shall be permitted to start until the 12 hours "resting time" shall have elapsed. A competitor may expend as much time as he likes at the starting control, but after having once been officially started from any control, the whole time until he reaches the next control will be counted as flying time.

(5) Starting Place—The start will be made from Sheepshead Bay, Belmont Park or Garden City, on Saturday, September 2d, 1916, at 1 o'clock P. M.

(6) Order of Starting—The order of starting will be by lot and announced five days prior to the start of the competition. Each aeroplane will be allotted a number which will correspond with the order of starting. This number must be displayed on the aeroplane in conspicuous places approved by the officials.

(7) Starting—The aeroplanes must be on the starting place 15 minutes before the time of starting, and any competitor failing to start within three minutes of his official starting time must remove his aeroplane out of the way if and when so ordered, and shall only be allowed to start with the sanction of the official starter, and his time shall be taken as from the original order to start.

(8) Start from Controls—Controls open at six o'clock A. M.

The competitor who makes the fastest elapsed time between controls shall start first, the others following at intervals determined by the difference between the time of their respective flights and the time of the fastest flight.

(9) Time cards—Each competitor before starting will be supplied with a time card on which will be entered his time of arrival and departure from each control. The competitor is alone responsible for the safe custody of his card and for its being produced and entered up at each control, and for the production of same when duly called upon.

(10) Stoppages—Stoppages en route between the controls are not prohibited, and frequent official landing places will be established between controls, about 50 to 100 miles apart.

(11) Timing—Competitors will only be timed from the departure from any one control to the arrival at the next control.

(12) Repairs—Individual replacements and repairs to the aeroplane and motor may be made, but the competitors making the repairs will be duly penalized according to the conditions to be decided by the Contest Committee. Changing of unbroken propellers and undamaged wings will not be penalized.

(13) Identification of Aeroplanes—Competitors must have their aeroplanes erected at the starting place not later than noon September first, in order that they may be marked by the officials. Any com-

petitor not having his aeroplane ready by the specified time will render himself liable to exclusion from the contest.

(14) Examination at Final Control: Each machine on arrival at the final control must remain on the ground for exhibiton and examination for at least 24 hours from the time of arrival.

(15) Carrying Passenger Compulsory—Carrying a passenger weighing not less than 145 pounds is compulsory. Equipping aeroplane with dual control to enable passenger to participate in piloting is allowed.

(16) Equipment for aeroplanes—Every aeroplane is required to have as part of its equipment compass, chart holder and fire extinguisher.

SUGGESTED PENALIZATION FOR REPLACEMENTS OF ENGINE PARTS DURING THE RACE WHICH IS TO BE MODIFIED AFTER SUGGESTIONS HAVE BEEN RECEIVED FROM ALL PROSPECTIVE ENTRANTS

It has been proposed that to make this contest a truly supreme test to American aeroplanes and American motors and bring out the best types it is necessary to apply a system of penalization for replacements of engine and aeroplane parts, so that while the Pulitzer trophy will go to the aviator who makes the best flying time in crossing the continent, regardless of the number of replacements, the prizes will go to those aviators who have made the best time in the contest after the penalization has been deducted.

There has also been suggested that the penalizations should be based on the following estimates:

PENALTY FOR ENGINE PARTS REPLACEMENTS

	Hours
Cylinder	4
Piston	4½
Piston Pin	4¾
Piston ring	4¼
Connecting rod	6
Crank-shaft	18
Connecting rod bearing	6
Main bearing	8
Valve	2
Valve spring	½
Push rod	1
Cam shaft	5
Timing gears	3
Oil pump	1
Water inlet	1
Water outlet	¼
Water pump	1
Rocker arm	1
Cam shaft bearing	5
Exhaust manifold	½
Inlet manifold	½
Oil pan	1
Propeller hub	1
Propeller shaft gear	2
Propeller shaft bearing	2
Propeller shaft housing	3
Crankcase, upper half	48
Crank case, lower half	3
Engine entire	4 days

Prospective entries are requested to give their suggestions, increase or decrease, against the figure given.

For replacements of aeroplane parts no penalizations have been suggested, and the prospective competitors are requested to suggest what the penalization should be for the replacement of diffrent parts, bearing in mind the proportions suggested for engine replacements.

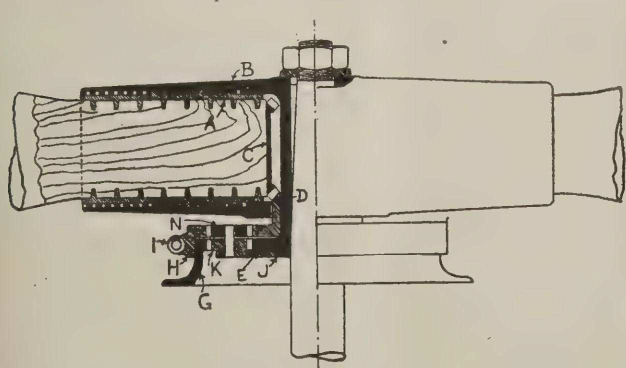
THE INTEGRAL VARIABLE PITCH PROPELLER

A VARIABLE pitch propeller, intended principally for use on airships, is that of the Integral Propeller Company of England.

The blades, instead of being formed in one piece, are mounted in a metal hub keyed onto the propeller shaft. The advantages claimed for the propeller are that it permits the employment of the engine to arrest the forward motion of the airship, and that at high altitudes, where the density of the atmosphere is reduced, it is possible to increase the pitch in order to maintain the engine revolutions and thus increase the speed of the craft.

In the accompanying drawing the details of the mechanism are shown:

"A steel sleeve, A, threaded on the exterior, is rigidly attached to the end of the blade by means of the projections into the wood shown in the sketch. This sleeve is screwed into the interior of the boss, B—mounted on the driving shaft, and at the end of the blade a bevel pinion C, is fitted, meshing with the second bevel wheel, D, which is concentric with the axis of rotation. A double planetary system of gearing then connects the tooth rim of the boss, at E, and the pinion, D, at F, with two annular toothed wheels, H and G—the two sets of planet wheels being mounted upon a floating plate, J, while a worm gear, under the control of the pilot, is fitted so as to mesh with the wheel, H. The annular wheel, G, is rigidly attached to the crank case of the motor or other fixed portion of the machine.



"When the propeller is driven by the engine the wheel, D, is carried round by the wheel, C, and with the hub and wheel, E, are rotated bodily as one piece about the axis of the driving shaft, thus causing the wheels, K and N, to rotate on their axes and roll round the interior of the annular wheels, G and H, at a reduced speed. From the fact that the wheels forming each pair of gears, E and F, G and H, and K and N, are of the same diameter, this rotation does not produce any change in the relative position of the blade to the plane of rotation, and as the axis of the sleeve, A, is coincident, or nearly so, with the line of centre of pressure on the blade surface for all working angles of incidence, there is little or no tendency for the air pressure to cause the rotation of the sleeve. The gear wheels employed therefore serve simply to locate the blade in the hub, and are not subjected to heavy loads due to the air pressure.

"To vary the pitch of the propeller, the worm, I, is rotated (this can be and is readily done while the propeller is in motion), which causes the relative position of the wheels H and G, to be altered. Since K is meshed with G—a fixed wheel—K and E receive no movement, due to the angular displacement of H, but N is made to rotate about its axis, and causes F to move C through D relative to the hub, B, thus altering the angle of the propeller blade. It will be observed that the rotation of the sleeve and blade by the wheel, D, tends to withdraw the teeth in C from those in D; but its effect is quite negligible, as the angle of movement is so small and the thread on the exterior of the sleeve sufficiently fine that in practice the amount of withdrawal only amounts to about one-hundredth of an inch.

(*Continued on page* 458)

CONSTRUCTION DETAILS OF THE L. W. F. BIPLANE

THE substantial drop-forged fittings used on the L. W. F. aeroplanes illustrate the advancement this company is making in the matter of carefully designed and practical details. To realize that a new era has been reached in the matter of producing efficient aeroplane fittings, it is only necessary to recall some of the sheet iron fittings that seem to have been so generally adopted, even by many prominent manufacturers. The L. W. F. Company's departure from these methods of questionable security should be generally recognized. The details illustrated are but a few of the many which go into the general construction of the machines. Quick assembly and knocking down for transportation are made possible by the use of ingeniously constructed parts, and those illustrated show what can be accomplished in this respect.

Number 1. illustrates the connection of one of the lower wing spars to the fuselage. The dome-shaped fitting is continued through the fuselage by a steel compression tube. The plate to which this fitting is attached follows the curve of the fuselage, and is attached to the fuselage by four bolts. Provision is made on the upper edge of this plate for turnbuckle fittings for cross wiring between struts.

Number 2. illustrates the fitting used at the top of the inverted V struts which are used between the fusilage and the upper plane. This fitting also serves to connect the two sections of the upper plane. The complete fitting is in three main parts, the two plates which are attached to the upper plane, and the strut socket fitting. A heavy pin connects the parts, and permits of easily setting up and taking apart of the members which they connect.

Both plates are provided with holes for cable connections, and attachment to the plane is by means of two bolts which clamp around the main plane spars. Lightening holes are made at intervals in the plates.

The strut socket connection is similar to the other main strut fittings, except that in this case the two short members of the inverted V merge into the one center socket.

Number 3. is the standard "ball-bearing" strut socket. The ball which is part of the socket, fits into a cup which is part of the plate. The cup is carefully ground to insure an even bearing for the ball. This fitting is used when the planes are staggered, as in the L. W. F. biplane illustrated in the May 22 number of AERIAL AGE, or can be adjusted to accommodate a strut when the planes are not staggered. When properly adjusted, a pin is driven through the cup and into the ball, permanently affixing the socket to that particular angle. The plate is attached to the main spar of the planes by means of two bolts, which clamp the spar, with another plate on the under side of the plane. The struts are of streamline form, tapering from the center and entirely covered with linen. The strut ends are tipped with a metal, which protects the ends in removing or replacing the strut in the socket. A bolt holds the strut in place in the socket. Where the bolt passes through the socket a washer is permanently fixed to the outside of the socket, giving an even bearing to the bolt and nut.

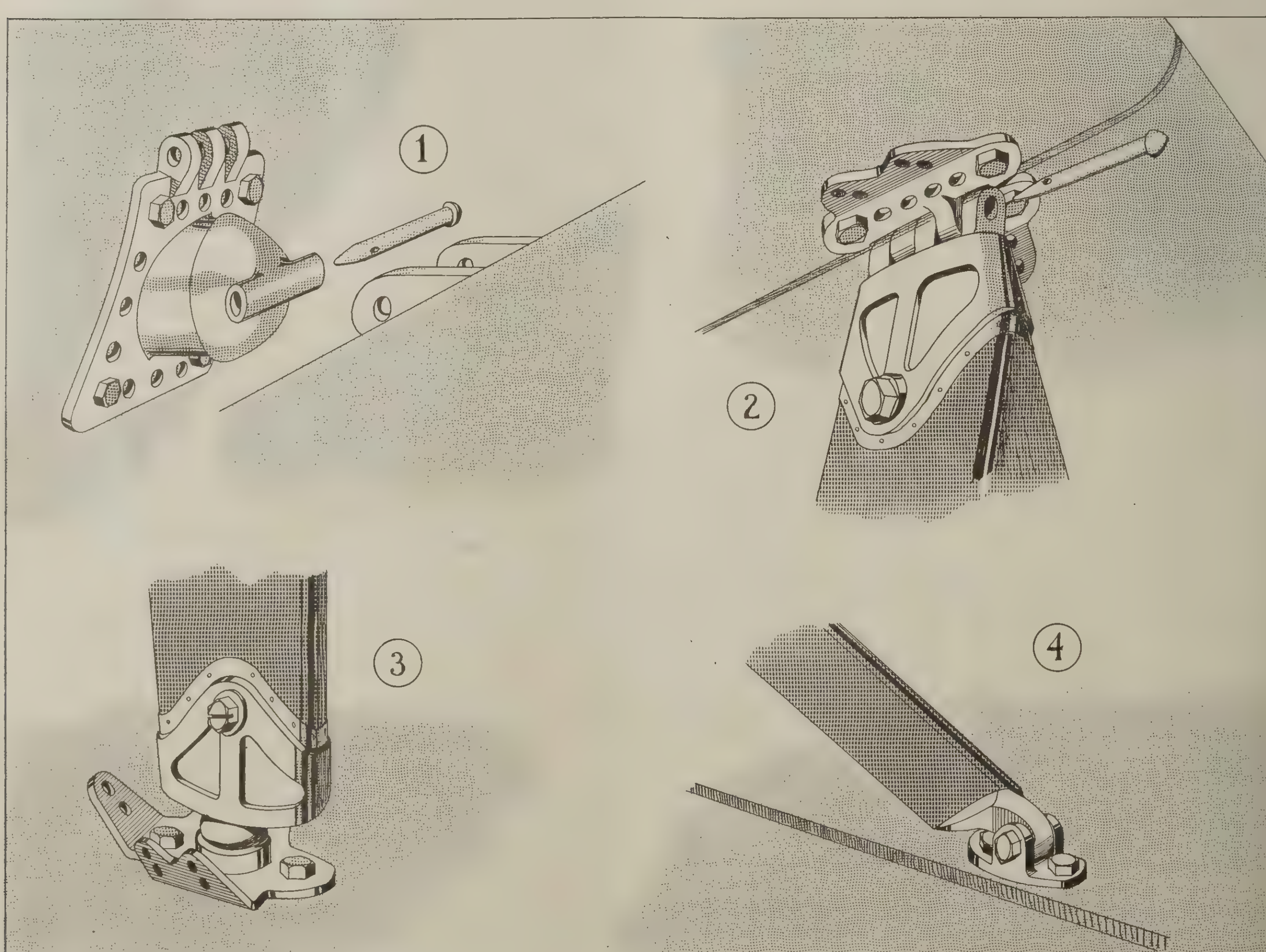
Holes for the cross wiring are provided on the socket plate.

Number 4. shows the fitting used between one of the tail braces and the tail plane. The tail brace is of steel tube with a wood section at the rear, making it streamline, and covered like the struts, with linen. The fitting is attached to the tail with two bolts, and it is adjustable to whatever angle the brace makes to the tail.

Although this is but a minor fitting, it shows the sturdiness of even the small parts.

Famous Athlete in Aviation Corps

John "Hobey" Baker, probably the greatest amateur hockey player in this country, and formerly Captain of the football team at Princeton University, has joined the Civilian Aviation Corps at Staten Island, and is taking instruction under Filip Bjorklund. The corps consists mainly of college men. Mr. Baker goes to the flying field after business and generally flies every day. He was able to pilot a machine after only a few days' instruction. He flies the Curtiss military tractor.



THE BUCK AUTOMATIC AERIAL TORPEDO

DR. F. W. BUCK, of Flagler, Colorado, has invented a new automatic aerial torpedo which consists of a design similar to a Whitehead torpedo which will have a destructive force as great as the Whitehead torpedo and will have a range of action over land or water of thirty miles.

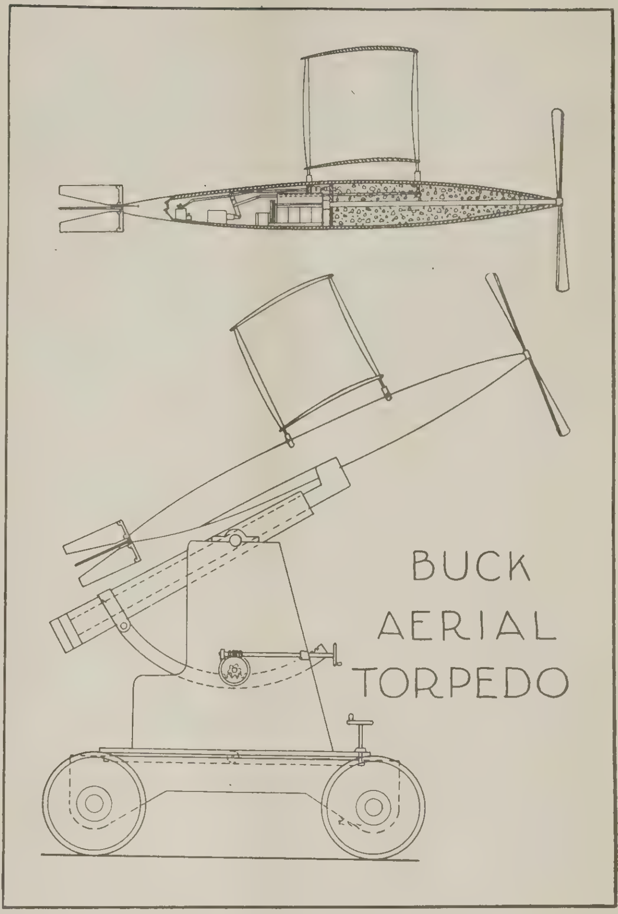
The design consists of a torpedo body containing the engine, explosive and timing means, suspended from an aeroplane in such a way that it can be automatically released from the aeroplane at any desired number of miles and yards up to thirty miles. The timing machinery will be set to work automatically before leaving the ground and the flight of the aeroplane will be controlled entirely by the automatic machinery.

In order to do away with the extra resistance of the wheels and landing gear and also to aid in directing the aeroplane in its proper range of flight, the inventor has designed a compressed air catapult on an automobile truck. The catapult is designed to be elevated at any desired range as well as to be set in any direction of the compass without changing the position of the auto-truck. The truck will also contain a compressed air tank connected to the engine of the truck for the compression of air.

The inventor made three models in which he expected to use 8-cylinder engines which developed 30 h.p. which he contracted for in New York, but, being informed that the 8-cylinder engines could not be delivered before the last of June and being anxious to demonstrate the efficiency of his invention on account of the demand for torpedoes for the European war, he accepted three 4-cylinder engines and attempted to make his flights with these at Flagler, Colorado, on April 15th and 16th.

However, he found the 18 h.p. 4-cylinder engines would only deliver about 10 h.p. in Colorado, owing to the high altitude of 5,200 feet, and as he had a total weight of about 400 pounds, he was unable to fly the machines except on the testing wire. However, he demonstrated the efficiency of his timing means and the automatic control by suspending the machines on a wire 300 feet long. He is now in New York arranging to get larger engines to complete his tests.

A company is now being organized, with headquarters in Colorado Springs, to develop the torpedo and to develop an aviation school and aeroplane construction plant.



Sturtevant Aeroplane in Parade

In the great Preparedness Parade in Boston, held on May 27th, one of the most striking features in the parade and an exhibit that attracted a great deal of very favorable comment was the delegation and display of the Sturtevant Aeroplane Company.

In the eleventh division of the parade about fifty employees of the Sturtevant Aeroplane Company marched at the head of the exhibit, following them there was towed the fuselage of a new Sturtevant Model S Tractor built for the U. S. Government and behind this there followed another section towing the wings of this machine on a truck.

The entire exhibit showed a Military aeroplane of the most modern type being transported by us in the usual Military Service manner.

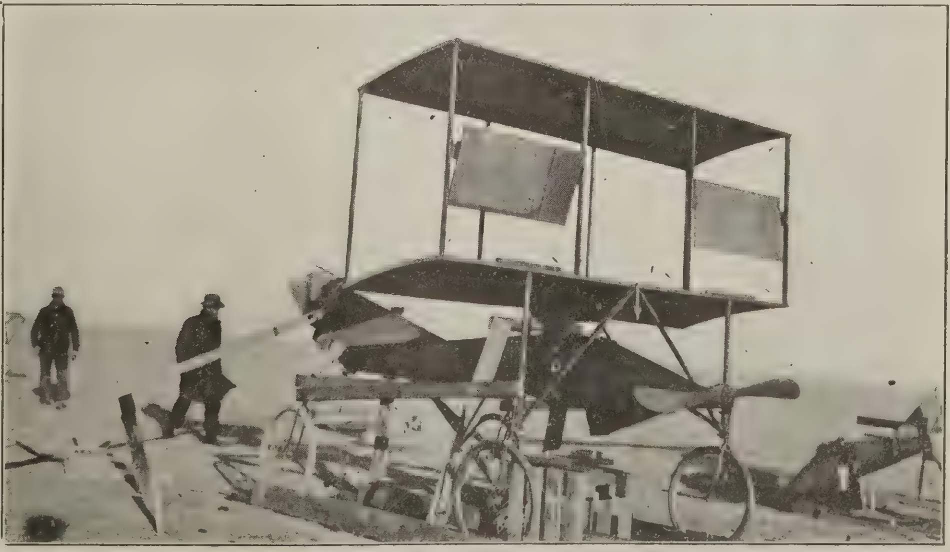
Personal Paragraphs

Clyde V. Cessna, the Kansas aviator, expects to enter the transcontinental race.

Bud Morris, chief of the Aviation School at Reed's Lake, near Milwaukee, reports the opening of his season's activity.

Don McGee is to spend most of the summer with a preparedness show that will be seen in many parts of the country.

The Buck Aerial Torpedo.



SKIN FRICTION OF VARIOUS SURFACES IN AIR

By Willis A. Gibbons

INTRODUCTION

The relation of skin friction or surface friction to the relative velocity of a surface and the surrounding medium, and the variation of this relation with the nature of the surface is of growing importance to the science of aeronautics. Owing to the greater speeds now developed in aircraft of all kinds, it was decided to investigate these relations with particular reference to the sort of surfaces which would be used in aeronautic work.

W. Froude measured the resistance for various surfaces of various lengths in a water channel, and the results of his experiments lead to the following conclusions:

1. The force tangential to the plane due to skin friction, ordinarily varies according to the 1.85-2 power of the velocity for smooth surfaces. For rougher surfaces, it varies practically as the square of the velocity.
2. The length of the plane has a decided effect on the average resistance per unit area, the resistance decreasing as the length increases.
3. Smooth surfaces do not necessarily increase according to a lower power of the velocity than *rougher* surfaces, although the numerical value of the resistance per unit area is less.
4. The index decreases as the length increases for smooth surfaces.

Zahm measured the resistance due to surface friction of planes in a current of air, and found that all smooth surfaces showed an increase in resistance according to the 1.85 power of the velocity. Buckram with 16 threads per inch gave a high resistance and an index of 2.05, practically 2.

He measured the resistance of planes of various lengths and obtained the following equation connecting the length of a plane with its velocity and surface friction:

$$P \propto L^{-.07} V^{1.85} \qquad (1)$$

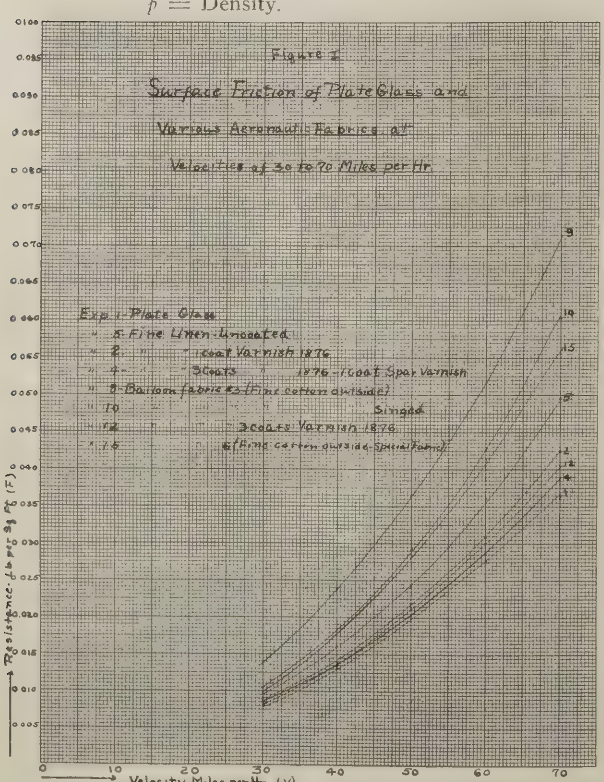
When V = Velocity in feet per second.
L = Length of planes.
p = Tangential force per square foot.

Lanchester shows that to express the resistance of a plane bringing into account the linear size and kinematic viscosity, we have the relation— $R \propto v^q L^r V^r$ (2)

When $q + r = 2$
v = Kinematic viscosity.
L = Linear size.
V = Velocity.

The kinematic viscosity[2] $v = \dfrac{u}{p}$

When u = Coefficient of viscosity.
p = Density.



The kinematic resistance, $R = \dfrac{F}{p}$, *i. e.*, it is the resistance per unit density.

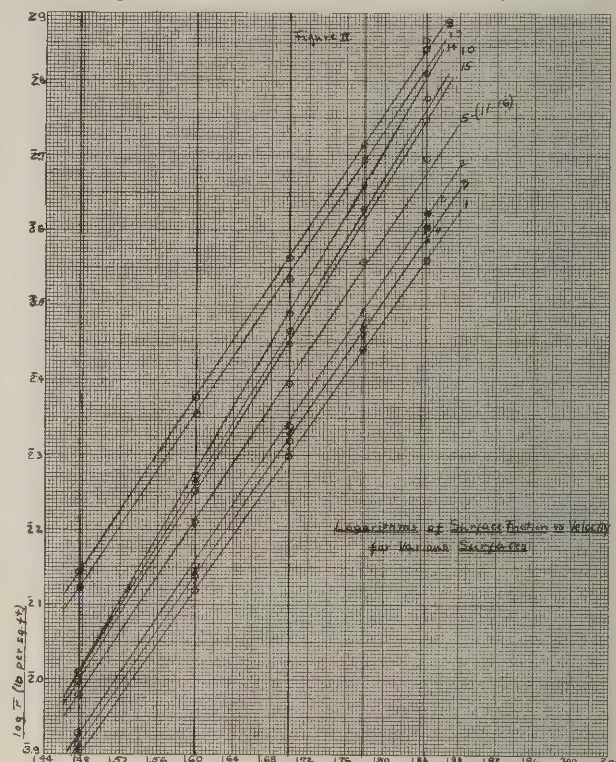
Lanchester points out that in terms of R, Zahm's equation (1) becomes

$$R \propto L^{1.93} V^{1.85} \qquad (3)$$

whereas according to (2) L and V should have the same index. He adopts the following for a smooth surface:

$$R \propto v^{.1} L^{1.9} V^{1.9} \qquad (4)$$

Assuming, what we have found to be the case, that the ex-



ponent varies with the nature of the surface, we may put this in the form $R \propto v^{2-n} L^n V^n$ (5)

whence $F = kpv^{2-n} L^n V^n$ (6)

For any one surface it is convenient to neglect the length, and embody this and the p and v values in one constant, so we have $F = KV^n$ (7)

The value of K depends of course on the units—throughout this paper F will be in lbs. per square feet, and V in miles per hour. The value of .1 for air is 1.3 times that for water, so this and the relative densities give a means of calculating from one medium to the other.

The values of n and K vary with the surface even for so-called smooth surfaces, and as will be shown, seem in such cases to bear a more or less definite relation to each other.

EXPERIMENTAL

Through the kindness of the Bureau of Construction and Repair of the Navy Department the excellent facilities afforded by the wind-tunnel of the Washington Navy Yard became available for experiments on the frictional resistance of various surfaces. These experiments were made for the purpose of looking into the matter of surface friction with particular reference to surfaces of the sort which would be of most interest from the standpoint of aeronautics.

A glass plate about 9½ feet long and 34 inches wide was suspended vertically, with its surface tangent to the direction of the wind, by two wires fastened to the upper edge of the plate. The ends of the plate were enclosed in slots in faired struts, which were fixed rigid to the floor and ceiling of the tunnel, and stayed to prevent vibration. Smooth steel rollers attached to each side of the slots, at the upper and lower ends, prevented side movement of the plate. They did not ordinarily touch the latter, being set to allow a clearance of 0.01 inch. Thus the plate was free to move within limits only in the line of the air current.

The trailing edge of the plate was connected by a steel rod to the balance, allowing the horizontal force to be measured.

FOREIGN NEWS

ARGENTINE REPUBLIC

After several unsuccessful attempts by Argentine and Chilean aviators to cross the Andes in an aeroplane, representatives from the Argentine and Chilean Aero Clubs are now endeavoring to accomplish this feat in a balloon.

During the past few weeks the Argentine pilots, Captain Angel M. Zuloaga and Juan Bradley, in company with Carlos Jose Obligado and Armando Venegas, of the Chilean Aero Club, made several trial ascents in the balloon, "Eduardo Newberry," to study the air currents. In one of these flights, in which the balloon started from the city of San Eugenio, Chile, crossed Santiago to Santa Rosa de Peral, an altitude of over 15,000 feet was reached. Captain Zuloaga on his return to Santiago, stated that very favorable air currents were encountered at an altitude of 12,000 feet, and expressed himself as being very optimistic about their future flight when they will endeavor to cross into Argentine territory.

At Buenos Aires, a scientific expedition will soon be carried out by means of aeroplanes by the Argentine Aero Club. Its object will be to explore certain parts of the Argentine Republic whose topography still remain unknown.

The first expedition is to start early in July and will explore Lake Mar Chiquita and the surrounding territory. This lake is located in the northeast corner of the Province of Cordoba. Little is known concerning its configuration, while there are many islands which are uncharted on modern maps. The lake covers an area of approximately 1,000 square miles. It is of paramount importance to both the provinces of Cordoba and Santa Fe, acting as a drainage basin during the rainy season when there is an over-abundance of rainfall in this region. At other times the lake has overflowed to such an extent as to inundate the country for miles around.

In this expedition the Aero Club will have the co-operation of the Argentine Scientific Society and the patronage of many well known authorities. It has also at its command considerable useful data gathered by several former exploring parties.

At the same time explorations will be made of the estuary of the river Iberá and the immediate surrounding territory with a view to canalizing the same, thereby connecting Lake Mar Chiquita with the Parana and Uruguay rivers and providing an easier outlet for the agricultural products obtained here. A second expedition will be sent to explore the river Patiño, which flows into the river Pilcomayo, in order to provide better fluvial communication with Bolivia.

Considerable interest is attached to the expedition, especially in view of the use of aeroplanes. The Aero Club officials responsible for the undertaking are very enthusiastic over its outcome, believing that with the use of aeroplanes, photographs can be taken of the topography and geography of this territory, which could not be obtained otherwise. The expedition is being financed by private subscription, and will be undertaken as a homage to the Centennial of Argentine Independence, which falls on July 9.

AUSTRIA

The following is the official Austrian report for June 16th:

"Today was a gala day in Czernowitz, being the occasion named for the unveiling of the new double-headed eagles on the City Hall to replace those removed by the Russians last year. The unveiling took place amid great festivity, but Commanding General Pfanzer and his staff failed to attend, owing to the danger from Russian aeroplanes, which circled over the town throughout the festivities. The roar of the distant bombardment continually interrupted the proceedings. At the height of the ceremonies a Russian aeroplane dropped a bomb a few hundred yards from the City Hall, causing a panic."

FRANCE

The following is the official report of France for June 18th:

"On the Verdun front our aviators made numerous attacks on German machines, which came to bombard Bar-le-Duc. During these engagements two enemy aeroplanes were brought down, one near Malancourt and the other at Samogneux. Three other German machines were hit at short range by our machine gun fire, causing them to descend vertically, the first at Fresnes, the second at Septsarges, and the third near Bethincourt.

"In Lorraine, four of our machines engaged four Fokkers above the enemy lines. Two of the Fokkers, of which one fell in flames, were brought down east of Bezange. One of our aeroplanes was compelled to descend.

"Our bombarding squadron also has displayed great activity. Twenty-four bombs were dropped on enemy depots near the Semide station (in the region of Vouziers); twenty bombs of large calibre on factories at Thionville, where two explosions were noticed; about twenty projectiles on the aviation establishments at Tergnier and Etain.

"During the night, enemy aeroplanes threw bombs on Pont-au-Mousson, Nancy and Baccarat. The material damage was insignificant. One person was wounded at Baccarat."

After having passed a few days at Lyons the French aviator Gilbert, whose escape from Switzerland caused such interest recently, has arrived in Paris.

Despite the fact that precautions had been taken to keep back the crowd, large numbers of people were present on the platform when he alighted from the train at the Gare de Lyon, and he was greeted with a tremendous ovation, being practically carried by his friends in their boisterous enthusiasm to the automobile waiting outside.

After paying some visits to his friends in Paris the aviator went to the rue Saint-Dominique to place himself at the disposal of his military chiefs. On his arrival at the Ministry of War he was warmly congratulated.

GERMANY

Capt. Boelke, the champion German aviator, who received an autograph letter from the Emperor recently complimenting him on his success in bringing down French aeroplanes, is believed to have been killed in an aerial combat with the French aviator, Rogers Ribiere.

A Fokker, painted yellow and of the type known to have been piloted by Boelke, who also wore a large yellow muffler, was shot down by Ribiere two days ago between the German and French trenches near Verdun.

Up to May 21 Capt. Boelke had accounted for eighteen French aeroplanes. The last hostile machine brought down by him was vanquished in an aerial battle over Dead Man Hill in the region of Verdun.

In an aeroplane raid in Italy the arsenal at Venice was bombarded. The official Austrian statement follows:

A squadron of naval aircraft on the night of June 11-12 bombarded extensively and with visible success the railroad tracks between Mestre and San Dona di Piave and the railroad station at Mestre. They obtained several full hits on a locomotive shed. The arsenal at Venice was also bombarded. Notwithstanding a heavy fire directed at them the aeroplanes returned unharmed.

A Zeppelin was destroyed in a wind storm near Chatelineau, South Belgium, on the 12th of June, according to frontier reports.

GREAT BRITAIN

Army Headquarters report for June 17 dealing with the west front says:

"There was better weather yesterday, and a marked increase in the activity of hostile aircraft. One of our machines attempted to intercept a hostile reconnaisance of eight machines, downing one close behind the enemy's trenches. Our machines, trying to cut off the remainder, engaged the rear machine and downed it a few miles behind the enemy's lines.

"There were thirty combats in the air with no other decisive results."

The following official communication concerning the operations in Egypt was made public on June 12th by the British War Office:

"Hostile aeroplanes raided Kantara (thirty miles south of Port Said on the Suez Canal), and with a machine gun fired on Romani yesterday. They were driven off with a few minor casualties at Kantara. No one was injured at Romani."

In a dispatch dated Sunday, June 11, the information is given that Noel Pemberton Billing, English airman and member of Parliament, visited the American squadron in France and took a flight over the lines. His feet were made so cold by the keen air that when he dined with the American aviators later he wore thick woolen socks instead of shoes.

The English airman complimented the American fliers and said he hoped to see them serving as a unit with the British army some day.

"During the last year and a half, the English public, for obvious reasons, has taken a keen interest in all that pertains to the German air service," says a writer in the *Motor Boat* of London.

"The success of the efficient airship as a naval auxiliary is well recognized. It is, in fact, rapidly becoming an indispensable unit of naval power. As a scout it has numberless points of superiority over either the cruiser or the destroyer. In clear weather the range of vision from an airship at moderate height is sixty to eighty miles. It can stay out for at least forty hours and can send and receive wireless messages up to 400 miles. Unlike surface scouts, cannot be driven off, for its great speed and powers of ascension enable it to draw beyond the range of any gun and yet remain close enough to observe with absolute distinctness the composition and disposition of an enemy's fleet."

A thrilling account of an aerial adventure between a British scouting biplane and a German battle plane is mentioned in a recent number of the *Autocar*.

While the British machine, which was unarmed, was scouting over the German lines, with Second Lieutenant Michael A. J. Orde, acting as observer, it was attacked from above by a German armed aeroplane. The British machine was in skillful hands, however, and was so expertly manoeuvred that the enemy was unable to score a hit, although the pursuit was desperately maintained. Presently a watchful battery of anti-aircraft artillery, concealed within the British lines, saw its chance and, landing on the German plane, blew one of its wings to atoms and brought it hurtling to earth, a mass of flames.

Lieutenant Orde, who has since had the misfortune to be captured in the course of his military duties and is now a prisoner in Germany, is by no means a stranger to German officers, as he took part in the Prince Henry Tour, and drove one of the automobiles with Prince Henry of Prussia, the Kaiser's brother, in Germany, and took an active part in the tour when the German competitors visited England.

The British War Office on June 14th issued the following statement:

In Egypt our aircraft on Tuesday dropped bombs on the camp and aerodrome at El Arish and the camp at Birmezer. A Fokker was attacked and brought down. A hostile aeroplane attacked Zarapena, but did no damage other than three minor casualties.

The machine attempted to drop bombs on ships in the Suez Canal, without results. It was driven off by gunfire.

ITALY

The following is the official Italian report for June 16th:

"Squadrons of aeroplanes bombarded with excellent results the railway station at Mattarello, in the Lagarina Valley, and encampments at the junction of the Nos and Campomulo valleys, on the Asiago plateau. Enemy aeroplanes dropped bombs on Padova, Giorgio di Nogaro and Porto Rosega. Two persons were wounded. The material damage was slight."

The following is the official Italian report for June 18:

"On the 15th six of our Caproni aeroplanes bombarded the railway station of Mattavello, in the Adige Valley. Yesterday a squadron of thirty-seven Capronis and Farmans dropped 160 bombs and 60,000 arrows on enemy encampments north Asiago and in the Nos Valley. The whole squadron returned safely. Two hostile machines were brought down."

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

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Motors for Model Aeroplanes

For a number of years after the inception of the model aeroplane as a medium of experimentation and sport, rubber was the chief means of propulsion. But as the interest in the new field increased, with a corresponding increase in the desire to construct models more closely resembling large machines, the limitation of rubber as a means of propulsion soon became apparent. Model constructors realized that to use rubber for motive power to get the desired results it was necessary to alter the plan of the model in such a way that its appearance when completed was different from that of the original machine. Consequently model flyers, both in England and this country, were prompted to experiment along other lines for a better means of propulsion, that is, to develop a motor that could be installed in a model of a large machine without the necessity of the design of the machine having to be changed with regard to exact reproduction. As a result of experiments that have been carried on both in England and this country model motors of various types have been produced that make possible the achievement of good results from scale models of large machines.

Without doubt, there are considerable numbers of aeronautical enthusiasts in this country who are constructing models of machines of their own design or models of full-sized machines that have already proven successful, and in all probability, when completed, these models will require motive power other than rubber strands.

With a view toward assisting those constructors in the matter of selecting a suitable means for operating these models a series of articles will appear in subsequent issues of Aerial Age, each article to deal with the operation of the various type of motors for use in connection with model aeroplanes.

Spring and Geared Rubber Motors

The possibility of using spring and geared rubber motors for model aeroplanes was dealt with at length by Mr. V. E. Johnson, Model Editor of *Flight* in a past issue of that paper.

"The idea of using a steel spring as a source of motive power for model aeroplanes, states Mr. Johnson, is one which has again and again been suggested to the writer. Since the steel spring form of motor is used with so much success in watches, clocks, model steamboats, locomotives, etc., etc., it is a very natural conclusion to come to, that the same thing more or less should hold in the case of model aeroplanes. Those who hold this opinion quite overlook, however, the difference in the amount of power required in the case of aerial locomotion, compared with any other form of transport.

"It cannot fail, however, to be instructive to compare different types of model motors when used on some *common* form of locomotion, other than of an aerial nature. As it so happens, the writer made some tests a short time ago with steam, electricity, rubber and steel spring motors on some small gyroscopic monorail models, which bear directly on the case in point. One test was the driving of a gyroscopic model (the same in every case) along a rail some 50 yds. long—the model in every case carrying its *complete* motive power.

"There was some slight difference in the weights, but the complete models in every case weighed well over 3 lbs. The weight of rubber required to propel the model was 11 grammes only, and it propelled it at running pace; it consisted of two motors of two strands of 3/16 strip each, 2 ft. long, geared through bevel wheels on to the same driving wheel and axle. All gears were of the same size.

"In the case of the steel spring, one of Messrs. Gamages' (England), the greatest difficulty was experienced in getting it to drive the model at all, for the simple reason that about 80 per cent. of the motive power of the spring was absorbed in driving the gear necessary in this type of motor to obtain any duration. So small is the power left over that quite a small additional resistance raises it the additional 20 per cent., and the motor stops.

"In the case of all the types of motors tried, anything in the nature of gearing was found to be terribly wasteful of power. That such was wasteful the writer knew, but he had no idea how wasteful it was until he made these experiments. In the case of geared rubber motors exactly the same thing holds. The only case in which gearing is of any use is in the case of a model with a single propeller, in which case it does pay to use two exactly similar strands of rubber and two gear wheels (the axle of one being also the axle of the propeller) having exactly the same number of teeth. The reader must not, however, draw the erroneous conclusion that even in this case nothing is lost in friction, because there is. For instance, suppose your model flies with twelve strands, then you will find on splitting your motor in two that two skeins of six strands each will be insufficient and that seven, or it may be even eight, will be required for each motor.

"The most economical and the most efficient manner in which rubber can be used as a motive power is in the form of long skeins of few strands and of many turns devoid of all gearing, and the reader will find that all 'records,' whether of distance or duration, are made with *twin* motors of this type. Possibly longer flights in the future will be made with motors of a treble, or even a quadruple type. About this we need not immediately concern ourselves, because even if such be the case no new principles will be introduced.

"Attempts have been made to split up the double motors of the twin propeller type of model into four strands by means of gearing in the same way as in the case of the single propeller model already referred to, but so far without any very pronounced success—the principal records having been made with twin rubber motors of considerable length and few strands, well lubricated and wound as nearly as possible to breaking limit, combined with propellers of large diameter, a machine of efficient surface and low head resistance flown somewhat high so as to take full advantage of the glide at the end of the flight."

(To be continued)

Illinois Model Aero Club News

The meet of the "Reds" and the "Blues" was postponed because of bad weather. Only a few members of each team showed up, which would have made the meet impossible at any rate.

At the last Friday night meeting of the club the semi-annual election of officers was held. At this meeting Mr. Emil Laird and Mr. Arthur E. Nealy spoke on exhibition models and exhibition man-carrying aeroplanes.

The new board of Governors follows:

President, Willis W. Hitt (reelected); 1st Vice-Pres., Joseph Lucas (reelected); 2nd Vice-Pres., Geo. Weaver; Secretary, Ward Pease (reelected); Treasurer, Henry Wells (reelected); Chairman Membership Comm., Verclare; Chairman Contest Comm., Thomas Hall; Chairman Social Activities Comm., Arthur Nealy (reelected).

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials cf contributor will be printed when requested.

Life Insurance

Pat was employed by an aeroplane construction company. As he was leaving the house his wife said:

"Do moind yez don't git hurt, Pat. It's so dangerous working in the aeroplane business."

"That's all roight, Biddy," replied Pat. "I borrowed two dollars from the foreman, and he don't let me do any dangerous work any more."

Angry Professor of Aerodynamics: Come now, no more fooling, what year did the Wrights invent the aeroplane? No quibbling, answer "yes" or "no"!

Hokus: "I see that the Government turned down all Bill's bids for the Alaskan Aerial Mail Service?"

Pokus: "What's Bill been doing now?"

Hokus: "Writing an essay on the decline of aviation."

Flight Commander (to aviator who has not enlisted): "You ought to be ashamed of yourself not helping your country. Why don't you join the aviation section?"

Aviator (with indignant tone): "What, with all this war going on? Do you think I'm a poor fool?"

American (In London): "Why, I always thought that the London hotels were fearfully expensive. I just got a suite of rooms on the top floor of the best London hotel for one pound a week."

Coster: "Suite o' rooms nuthin'. Them's the Zeppelin parlors you got!"

Aviatrice—"Why is dancing like milk?"

Aviator—"Strengthens the calf, silly."

(The dull thud of the axe woke the sleeping child next door.) —*Purple Cow.*

Aviator—"I was where the bullets were thickest."

She—"How brave, and what did you do?"

Aviator—"I handed out the ammunition."—*Siren.*

Stude (on the aerobus as conductor steps on his foot)—"You don't handle your feet very well."

Conductor—"What do you want for a nickel—Pavlowa?"—*Record.*

"You advertised as chauffeurette-maid."

"Yes, madam."

"What were your duties at your last place?"

"I drove and cleaned the cars single-handed."

"And as maid?"

"I took down my lady at night and assembled her in the morning, madam."—*Punch.*

The Battle-Cry of Peace

A Review

Bombs, explosions, conflagrations,
Punctuate this fight of nations;
Spies, deception, executions;
Battleships in evolutions;
Motor cars, and men deploying;
Airship raids—oh, most annoying!
Things occur in quick succession,
You can't follow their progression.
Here machine guns roar and rattle;
There go submarines to battle;
Here a general or two—
Bang! They disappear from view.
Thus the camera machine
Flashes on the movie screen. —*Ex.*

Browning Again

Sharp—"That motor is like a youth's fancies in Springtime."

Carp—"M-m-m-m."

Sharp—"It shows a tendency to spark."

"My ancestors came from a noble line," said the would-be aviator.

"Yes, I noticed it cropping out," replied the instructor.

"Arm. We need more soldiers, a larger navy and a large fleet of aeroplanes. We must have protection. Why in this state of unpreparedness——"

"Sit down, kid. Your lungs are getting rusty. This state is as well prepared as any in the whole United States."

Above the Ground

Belle—Do you believe that matches are made in heaven?

Bella—That isn't where the sulphur is.

The Patient's Idea

Doctor (to hurt aviator)—You've had a pretty close call. It's only your strong constitution that pulled you through.

Patient—Well, doctor, remember that when you make out your bill.

Lexicography

Mr. Popp—Here's a county out in Kansas where every ninth man has an automobile.

Johnny Popp—Oh, Dad, is that what they mean by the submerged tenth?

Words, Idle Words

1st Visitor—"I see that the English struck a terrible blow at the enemy."

2nd Visitor—"Is that so? What did they say?"

Expected

Traveling Aviator—"Isn't this train pretty late?"

Station Master—"Yes, she is a bit behind, mister, but we're expectin' her every hour now."

THE POOR DOG.
"I can follow on a run, a high jump or a swim,
But when my master quits the earth I say good-by to him."

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WEEKLY

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Congressman Hay's Responsibility

ALAN R. HAWLEY, President of the Aero Club of America, on June 21, sent a letter to James Hay, Chairman of the Committee on Military Affairs of the House of Representatives. On June 24 Representative Hay recommended an additional $2,000,000 appropriation in the Army Bill for the purchase of aeroplanes for the national guardsmen. In his letter Mr. Hawley said in part:

"We are amazed at your stand against the plan to provide for the establishing of aviation schools for training army, National Guard and civilian aviators to meet the Mexican emergency. This is not the time to fool with half measures. It is too dangerous and costly.

"It is almost entirely due to your efforts that the United States Army has not had sufficient aeronautical equipment to cope with the Mexican situation. We have urged and protested to you and pointed out the danger to come for the past two years. We first pointed out that the lives of army aviators would be endangered by niggardliness in aviation equipment.

"Later, after the Villa raid on Columbus, we pointed out that it would mean loss of American lives and the destruction of American property. These things have happened and worse will happen unless prompt steps are taken to provide for a sufficiently substantial aeronautical organization. We will be frank and state that no man is big enough to assume the responsibility which you are assuming in opposing the development of the air service.

"If conditions are as they seem to be in Mexico the army will need immediately 200 aeroplanes in every day use to protect the United States Army from the larger Mexican forces. We have at the present time twelve aeroplanes with the Mexican expedition and none whatever for training more fliers.

"Nor do we have a single permanent aviation station, no provision having been made for the acquisition of North Island at San Diego Bay, which the army needs so badly.

"The Aero Club of America has been paying for the training of thirty-five national guardsmen of as many States, most of whom have been and are being trained at Newport News. These officers ought to complete their courses under the direction of an army flier. The Adjutant Generals of forty States have advised us that they have a total of about 500 guardsmen ready to take up aviation. Provision should be made for training these men, who have had military training and will make the best kind of aviators. Unless Congress allows the means for continuing the training of the officers who are at Newport News they will have to return to their States before completing their training."

Admiral Peary for Senator

THE Aero Club of America has written to Governor O. C. Curtis, of Maine, endorsing the suggestion made to the Governor that he appoint Rear Admiral Robert E. Peary as successor to U. S. Senator Edwin C. Burleigh, deceased, for the unexpired term of two years.

The letter which is signed by Mr. Alan R. Hawley, President of the Club, reads as follows:

"Hon. O. C. Curtis,
"Governor of Maine,
"Augusta, Maine.
"My dear Governor Curtis:

"The officers and members of the Aero Club of America have read with great interest the suggestion to appoint or select Rear Admiral Robert E. Peary as successor to United States Senator Edwin C. Burleigh, deceased, for the unexpired term of two years.

"As has been stated, Rear Admiral Peary has been one of the most active and ardent Americans in the unforseen crisis in which our country has been thrust.

"Patriotic, progressive, well informed on all national problems, a leader in the subject of national defense and master of the technicalities of developing our national defense, Admiral Peary stands as a unique figure, a man who has already achieved international reputation and is especially fitted to assume a position where he can invest his extensive knowledge and his well-founded convictions for the benefit of his country. Rear Admiral Peary is just the kind of man this country needs in this crisis, and looking at it from a national standpoint we feel sure that any State would consider it a distinction to be represented in the Senate by such a representative man.

"Rear Admiral Peary has already done much for the State of Maine—how much only people living in different parts of the United States can tell. The officers of the Aero Club of America were told recently by a business man that Rear Admiral Peary gave the State of Maine national advertising valued at not less than five million dollars in the last six months only, through developing the very valuable plan for the aerial coast patrol. Due mostly to his efforts, the State of Maine has achieved the distinction of having the first station of this aerial coast patrol system—a distinction which will undoubtedly go down in history.

"It is to be hoped that the State of Maine will surely select Rear Admiral Peary as its representative in the United States Senate. Yours very sincerely,
"ALAN R. HAWLEY, Pres.,
"Aero Club of America."

Mobilizing Civilian and National Guard Aviators

THE Executive Committee of the Aero Club of America and Major C. F. Hartman, Signal Service, Eastern Division, U. S. A., who has been ordered by the War Department to supervise the work of mobilizing civilian and National Guard aviators, which the Aero Club of America began soon after Villa's raid on Columbus, three months ago, worked all evening June 25 and until early morning completing the plans.

As a result of its continuous energetic work the Club was able when the crisis came and the War Department was enabled, through Congress voting the necessary appropriations, to take up the work of mobilizing the National Guard and civilian aviators, to present to the War Department a list of prospective military aviators and students who are ready to enter the services of the Government as part of the Army Air Service. The list transmitted to the War Department by the Club includes forty National Guard officers of different States who have been training at different aviation schools at the expense of the National Aeroplane Fund of the Aero Club of America; thirty licensed aviators who have volunteered their services to the Aero Club of America; about three hundred National Guard officers of different States who applied to their respective Adjutant Generals to be detailed to aviation duty and who were only waiting for the Club to send them to aviation schools to begin training; and about four hundred civilians, students in aeronautics, experts on gasoline engines, and other, not especially versed in mechanics or aviation, but anxious to volunteer their services to serve in the Army Air Service, and to go to Mexico.

Major Hartman advised the Executive Committee of the Aero Club of America that all these volunteers, National Guardsmen, would promptly be considered by a board of Army officers which will promptly detail those who pass the

examination to learn to fly or complete their tests at the various aviation schools which are now to be operated under the direction of an Army officer, the concerns operating these schools having offered the facilities of their schools and the services of their pilots and mechanics.

The Army has already made arrangements to operate the Hempstead Plains Aviation Center, which is located one mile from Garden City, Long Island, which is controlled by the Wright and Curtiss Aeroplane Companies.

All civilian aviators and National Guard officers who can pass the tests and obtain pilot certificate will be sent to the Mexican border, where there are being established ten aviation centers with smaller aviation stations between, forming a chain of stations which will enable the Army to maintain a continuous aerial patrol.

As the appropriation allowed by Congress a few days ago for Army aeronautics is to cover also the cost of the trucks, motorcycles and other equipment besides the aeroplane, the appropriation of $3,500,000 is far from sufficient to carry out the plan under consideration. But efforts will be concentrated in training aviators, while Congress is being asked to allow the necessary funds with which to carry out this plan.

Difficulties of the Mexican Campaign

SOME of the extreme difficulties our aviators are facing in Mexico were described yesterday by a United States Army officer who is helping to rush more aviators to the front. He also told how the troubles are being overcome as speedily as possible.

"Most of our difficulties were entirely unexpected," he said. "In the rush, our chief anxiety was to get machines where they were so badly needed. Naturally enough, it was assumed that the aeroplanes which had made such records in this country and were giving such good service in Europe would give the same perfect service in Mexico. It was not until we had had actual experience on the spot that we discovered the new problems due to entirely different conditions.

"It is a remarkable fact that practically all the difficulties which, in other places, aviators come across singly are all found mobilized, as it were, into one big united force against us, in that part of Mexico where our men are. It is this that has made the situation present a new problem in aviation.

"You see, in Mexico we are up against very high temperature, the elevation of Denver, the dry air of Minneapolis, the rising and falling air currents due to the desert and a soft, light sand covered with low brush. These conditions are the very worst possible.

"On account of the high temperature in this section of Mexico the water in the radiators will reach a temperature of as much as even 140 degrees when the motor is not running. This is being overcome by providing deeper radiators, so as to get more water-cooling area.

"The sand is so light that the weight of the machine sinks the wheels very deeply, making getting away and landing extremely difficult. The sand trouble is being beaten by making new, flat, wide tires.

"At high altitudes the air is so rarified that it cuts down the climbing and weight-carrying possibilities of the machine.

"The chief trouble, however, is with the propellers. Propellers which stand tests of several hours' continuous running in the test shops here go to pieces in only a few minutes in the Mexican air. The air down there is so dry it seems to have an effect on the wood beyond anything we had dreamed of. We appear to be dealing with an absolutely abnormal climate and there was no existing data to act as a guide or even to suggest the possibility of such a condition.

"It is so hot down there during the daytime that the aeroplane mechanics have to cool steel chisels or other metal tools before they can handle them.

"It would not be easy to conceive a worse place for flying than this part of Mexico. There are not only the varying currents due to the heat of the desert, but there are fierce whirlwinds. Whirlwinds can be seen when you are on the ground because the effects are obvious. They are as invisible to the flyer as they are deadly to him. Machines standing on the ground have been suddenly caught in one of these whirls, spun around in the air and overturned.

"Our men will need a lot of practice. We must have very many aviators and a big supply of aeroplanes of various types. We also must have many trained mechanics. We must get men who have 'Motor Sense'—that's the sort of men.

"You cannot exaggerate the benefit an efficient aviation service would be in the task before us in Mexico—and we must have that service—and get it as quickly as can be."

Aero Club Invites American Airmen in France to Return for Mexican Service

AN invitation to the daring Franco-American Flying Corps to come back to fly for the United States in Mexico has been sent by the Aero Club of America. The cable, which also stated that the Club will pay the transportation for six members of the Franco-American Corps to the United States, is as follows:

"Lieutenant William Thaw,
"Flying Corps, Paris.
"Mexican trouble finds United States Army with only fifteen aviators. Please advise whether members Franco-American Corps can come to serve in Mexican campaign if needed. Aero Club of America will pay transportation of six aviators.
"AERO CLUB OF AMERICA."

The Franco-American Flying Corps is composed of Americans, including the following: Lieutenant William Thaw, Sergeant Elliot Cowdin, Norman Prince, Bert Hall, Sergeant Kiffin Rockwell, Corporal J. M. McConnell and M. Balsley.

These aviators have won distinction by their daring as military pilots, and Lieutenant William Thaw has not only received the military medals, but has been mentioned for the Cross of the Legion of Honor. Most of these aviators have brought down a number of German machines in battles above the trenches.

On May 17 the American Flotilla, for the first time as a unit, took part in an expedition over the German lines. The bullets of German anti-aircraft guns struck the tailpiece and propeller of Lieutenant Thaw's machine, but he managed to pilot it back and make a safe landing. Corporal Victor Chapman's machine was also hit, but he, too, returned safely.

On June 1, while the American squadron was reconnoitering, five of the American machines attacked fourteen German aircraft, hoping to drive them back to the German lines. The Germans opened fire with machine guns and the Americans responded. The explosive bullets used by the Germans did great damage, and soon two American machines were forced to the ground, one with a ripped gasoline tank and the other with a broken gun. Then two German machines were forced down by the fire of the remaining American pilots. Corporal McConnell, who had two machine guns on his swift machine, did great execution with them, but finally after nine bullets had struck his machine, he was forced to descend.

The Aero Club of America has been urging Congress to immediately appropriate the funds necessary to establish ten aviation schools to train aviators for the Army, National Guard and a civilian reserve, and to provide the Army and National Guard with the necessary number of aeroplanes and equipment. The Club advocates the immediate training of 500 men, so as to get 200 aviators and 200 observers as soon as possible.

The records of the members of the Franco-American Flying Corps, some of whom had offered their services to the United States Government for aviation before going to Europe, show how civilians may in a short time become good military aviators.

An offer to train three aviators free of charge has been received by the Aero Club of America from the Thomas Brothers Aeroplane Company. As the Aero Club has been flooded with applications from the National Guard of practically every one of the forty-eight States, and from civilians who are anxious to take a course in aviation, this offer of the Thomas Company was very welcome.

Following the policy of giving preference to those who asked first, the Executive Committee of the Aero Club selected three officers whose applications were received several months ago. Lieutenant Anthony Sunderland, First Lieutenant Connecticut Coast Artillery Corps, and Mayor of Danbury, Conn., was the first to take advantage of the Thomas Company's offer, and is now training at the Thomas School at Ithaca. Lieutenant H. F. Wakefield, of the Vermont National Guard, and Lieutenant Keeling R. Pulliam, of the Kentucky National Guard, have been offered the two remaining Thomas scholarships. In the event of the Mexican situation preventing any of these officers from taking the course, the scholarships will be granted to Corporal Charles T. Robins, of the Arkansas National Guard, and Lieutenant W. E. Lewis, of the Illinois National Guard.

The applications from men who wish to learn to fly are flooding the Aero Club. They come from every walk of life—all of whom have one desire, to learn to fly, so as to be of maximum service to this country in case of trouble.

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The News of the Week

Princeton Men in Aero Corps

Eleven Princeton men have signed for the aviation section of the naval militia which is being organized by Lieut. J. H. Stover for coast defence.

The men have signed for three years and will be expected to attend one drill a week during the winter on board the U. S. S. Adams, stationed in New York Bay, and two weeks' service at the summer camp on Raritan Bay, Keyport. At the end of three years the men are to be graduated as non-commissioned officers of the United States Aero Corps. They will be instructed not only in the use of aeroplanes but in steam and turbine engines and the handling of small boats.

The following men have signed: A. W. Bevin, H. G. Brown, P. H. Gadebusch, D. Kennedy, J. B. McTigue, K. A. Metzerott, A. O'Brien-Moore, W. Rukeyser, L. W. Sellers and J. Q. Horne.

Planes on Border to Have New Motors

In order to overcome the difficulties which the army experts are experiencing with aeroplane propellers on the border, the War Department's latest order includes machines with twin 90-horsepower motors instead of the single 160-horsepower machines. The expert fliers have concluded that the greatest trouble is with the big motors rather than the border's intense heat which causes unusual expansion and contraction.

Reserve Power of Curtiss Motors

A satisfactory test run on June 2 was officially conducted by the Government inspectors of Curtiss "VX" 160 H.P. motor No. 3201.

This motor was subjected to an eight-hour dynamometer test run, during which time the horsepower developed at 1400 r.p.m. was always better than 160. Upon the completion of this continuous eight hours of running and without stopping the motor, the throttle was opened wide, and although the revolutions were held down to 1400, the motor developed and maintained for some time 192 h.p. The company adheres to a policy of making always conservative statements and claims of the capabilities of its products, and the above performance is cited as an instance of showing the reserve power above the rating of 160 h.p. as advertised for the "VX" motor.

American Aviators to Stay in France

The American aviators in the service of France are not able to comment on or reply to the inquiry from the Aero Club of America whether they will return to take service in the American Army in the event of war with Mexico. They are prevented from replying by the fact that they have enlisted in the French Army for the duration of the war and are subject to army discipline.

The only manner in which this subject could be taken up would be by negotiations between the governments of France and the United States. The case of the Garibaldians released from the service of France to fight in Italy is not parallel, inasmuch as these soldiers returned to their own country to fight with the Entente Allies.

Ask Flying Privilege

For the instruction of army and navy aviators a large hydro-aeroplane station will be established in Harlem, if the city will grant certain privileges to the New York Flying Yacht Club. A committee consisting of George V. W. Pelz, president of the Harlem Luncheon Association, which is composed mainly of members of the Harlem Board of Commerce; William H. Chorosh and J. C. ("Bud") Mars, an aviator, has an appointment with Cabot Ward, Commissioner of Parks, and R. A. C. Smith, Commissioner of Docks and Ferries, and the matter of obtaining the necessary concessions will be discussed.

Export of Aeroplanes

During the week of June 18th aeroplanes and parts were exported to Great Britain to the value of $69,422.

Aviation Section New York Naval Militia

On Saturday, June 24th, the Aviation Section of the First Battalion, New York Naval Militia, made great progress. Each man was given individual instruction in operating the machine while in flight. Lieut. Harris piloted the machine. Weather conditions prevented flying on Sunday.

An Aerial Patrol for the Border

According to press dispatches, the Secretary of War has before him a comprehensive plan for the aerial patrol of the Mexican border to be made effective as soon as circumstances warrant. It contemplates purchases by the Government of aeroplanes owned by various firms and civilians throughout the country and the enrollment of civilians into the army service as aviators.

Definite steps already have been taken to carry out the plan. The first move made by the War Department was to communicate by telegraph with every aeroplane manufacturer in the country and to ascertain the number of aeroplanes owned by civilians which might be available.

Col. George Squier, head of the aeronautical branch of the army, is understood to have received telegraphic replies informing him just how many machines he may count on, and how soon they can be available for service. He will be in a position to put the plan into execution within a few hours after Secretary Baker gives the order.

Though Col. Squier himself would not comment on the plan, other officers at the War Department said today that it would be perhaps the most feasible border patrol, so far as insuring United States territory against attack was concerned.

The enrollment of civilian aviators in connection with the duty of the National Guard amounts to supplying an aerial defense which otherwise would require months to perfect.

The aerial patrol plan is independent of the work which aeroplanes attached to the American forces in Mexico may be called upon to perform. These aeroplanes would continue their scouting duty and otherwise render service to the forces in Mexico, but the border patrol would be especially arranged to protect American territory.

The aviation section of the New York Naval Militia at Bayshore, Long Island; Lieut. L. H. Harris in charge.

The Burgess-Dunne Seaplane used by the Second Battalion N. Y. Naval Militia.

Naval Militia Aviators Arouse Interest

According to reports in the *Brooklyn Eagle,* so much interest has been aroused by the flights of the New Jersey Naval Reserve hydroaeroplane, presented to them by Mr. Inglis M. Uppercu, of the Aeromarine Plane & Motor Co., that the residents are opening up their summer homes earlier than usual.

Fourteen Aeroplanes Ordered for Aero Patrol

The War Department has ordered fourteen high powered aeroplanes in pursuance of its plan to establish an aerial patrol of the Mexican border. The machines with all spare parts will cost approximately $275,000. They are to be supplied by the Sturtevant Company, of Boston; the Thomas Company, of Ithaca; the Curtiss Company, of Buffalo; the L. W. F. Company, of Long Island City, and the Martin Company, of California.

The fourteen aeroplanes will be despatched at once to the border. Meanwhile arrangements are being completed for supplying pilots to operate these and others and the War Department generally is developing the aeronautical service on broad gauge lines which will take full advantage of the $3,220,000 which Congress has practically pledged.

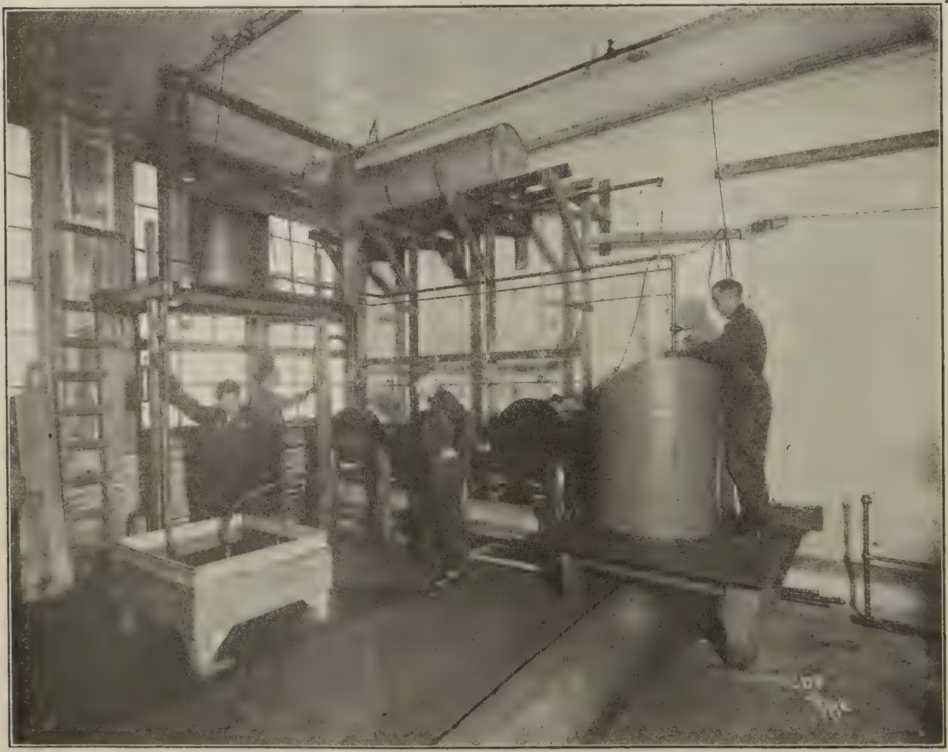
The features of this comprehensive plan are the arrangements for obtaining army aviators from among civilians in the National Guard and in other walks of life, the standardization of motor shafts, propellers and other essential parts of aeroplanes, including the control, and the establishment by the War Department of a Government inspection in co-operation with aeroplane manufacturers throughout the country.

War Department inspectors have been assigned to go to the aeroplane plants and work with the manufacturers step by step so there will be no longer any question of rejecting the machines ordered by the Government for service. These machines will have been approved and inspected before they are turned out. Red tape and delay will thereby be eliminated.

The Department has tentatively indorsed the standard "dep" control for all aeroplanes, and manufacturers throughout the country are being informed that this control must govern the operation of army and navy machines. By this means any aviator in either the army or navy can operate any machine in the service. Up to the present with the various types of control it has been impossible for an aviator to operate any other than the machines to which he has been accustomed.

By the standardization of motor shafts, propellers and other parts the aeroplanes sent to the border can be constantly kept in condition and the motor or spare parts of one will fit other machines. With a view to reaching speedily this desired standardization the War Department has appointed committees to confer with engineering societies, especially with the Society of American Engineers, which is a motor organization. This society has also appointed a committee to confer with the War Department experts and all that remains now is for these experts to work together.

Special committees of army experts have also undertaken the task of studying the problem of suitable propellers with special reference to such conditions as prevail in Mexico and along the border.



Testing gasoline tanks at the Curtiss Aeroplane Co., Buffalo.

It is explained that conditions along the border and in Mexico are such as to tax the capacity of aeroplanes to the limit. The aeroplanes stand out in the hot sun eight or nine hours with the wood being subject to a temperature of 115 to 120 degrees Fahrenheit. High power motors have a tendency to tear the wood to pieces when the machines are sent up.

These difficulties have not daunted the War Department, but have simply caused the experts to concentrate their attention on the best means to overcome them. The War Department has much of the information which the armies of Europe have used in obtaining suitable propellers, but conditions in Flanders, it is explained, present no such atmospheric or climatic difficulties as exist on the Mexican border.

The all important question of getting army aviators from civilian walks of life has been successfully solved in accordance with expert interpretation of the law and the department commanders wil take steps to form aeroplane units from the personnel of the National Guard.

The law prescribes that aviators of the Signal Corps may be made up in personnel from especially qualified civilians who shall be appointed and commissioned. It is incumbent on the Signal Corps to prescribe these conditons, and civilians who can meet them are eligible to enter forthwith the service of the army for duty on the border.

These civilians are commissioned as reserve officers to be utilized in event of war. In other words, civilians in any State in the Union who desire to volunteer for service in the aeroplane arm of the army service may do so by simply learning to operate a machine supplied them by the Government and meeting, of course, the conditions prescribed. At the expiration of war service they will return home and follow their normal occupations, but with the stipulation that they can again be called into service should war arise.

Measures are already being taken tentatively to form so-called aero units from each National Guard organization of the various States and the District of Columbia. The militia organizations on the border will supply the money and details will be worked out there.

For immediate duty with the army there will be fifteen qualified aviators graduated from the aviation school early next month. These will report to the border while the general plan to develop the aerial patrol is pushed forward.

Chicago News

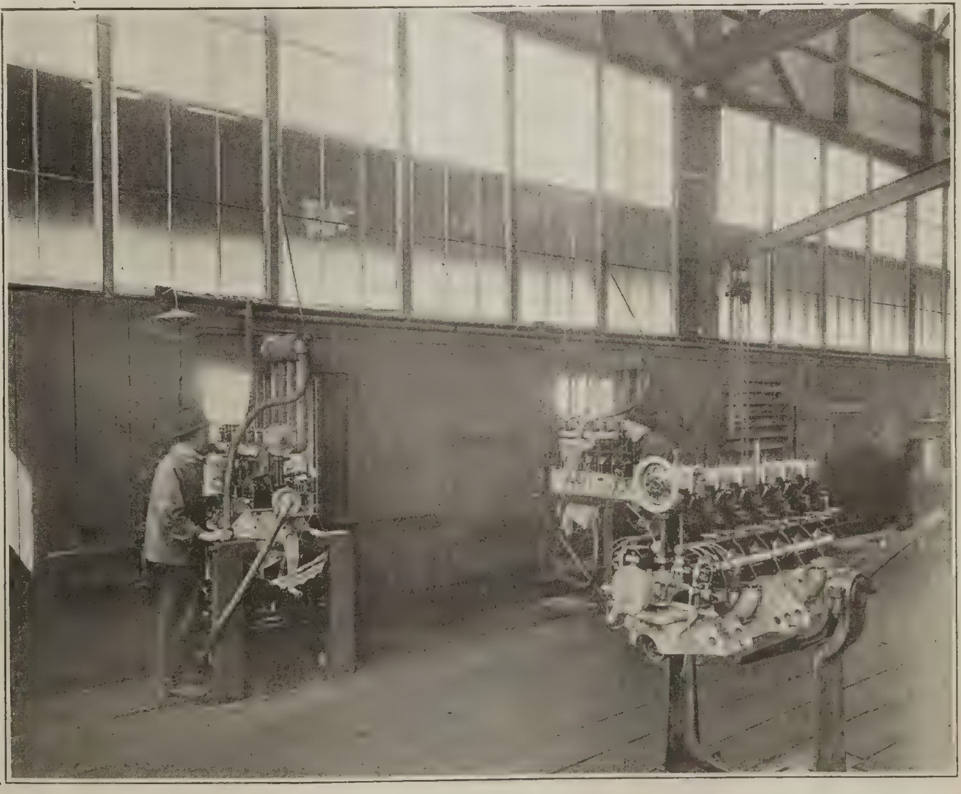
The Chicago Aero Works have just installed a 50 horsepower Gnome in W. A. Couch's Stupar Tractor.

Messrs. Shank & Callahan have a date to fly their Stupar Tractor on July 4.

Lieut. W. F. Sullivan, of Newport, R. I., who has just returned from the war zone.

Aeroplane Industry's Great Growth

The remarkable growth of the aeroplane industry of the United States is indicated by the exports of 398 aeroplanes for 1915 againset 40 in 1914 and 19 in 1913. The value of the 1915 exports was $2,960,814, or an average of $7,439 per machine, against $6,337 in 1914 and $3,227 in 1913. The exports of aeroplane parts were also very large, amounting to $2,457,782, as compared with only $145,997 in 1914 and $25,606 in 1913. Imports of aeroplanes into the United States decreased from 16 and 13 in the fiscal years of 1912 and 1913, respectively, to only one each in the fiscal years of 1914 and 1915.



Two inside test stands at the Hall-Scott factory near San Francisco. The horseshoe stand permits rapid dissembly of the engine

Seaplanes to Co-operate with Atlantic Fleet

In order to determine the practical availability of hydro-aeroplanes the Navy will soon, for the first time, try them out under test conditions at sea. The experiments will be undertaken this summer during the maneuvers of the Atlantic fleet. Six of the seaplanes are now being put aboard the armored cruiser North Carolina at the Pensacola naval aviation station.

The North Carolina is fitted with a catapulting device, by means of which hydro-aeroplanes may be launched in the air in any weather, no matter how rough at sea. The device was recently perfected and is said to be in advance of anything now in use in foreign navies. Heretofore it has been possible to use the aircraft only in good weather.

It is stated that the North Carolina will be fitted with a hydrogen generating plant and carry a kite balloon for observation and fire spotting. She will operate as a scout in advance of the fleet, and the hydro-aeroplanes will be employed to extend her radius of action.

Indianapolis Speedway as Training Ground

Carl G. Fisher, president of the Indianapolis Motor Speedway, has offered the use of the Speedway as a training camp for Government aviators as a part of the general Indiana preparedness scheme in which he is interested. The offer was made to Howard I. Coffin, of Detroit, chairman of the naval consulting board of the United States, when the latter was in Indianapolis a few weeks ago, and it was renewed in a letter addressed to Mr. Coffin recently by Mr. Fisher.

Mr. Fisher said yesterday he had offered the use of the Speedway as a training place for prospective aviators free of all expense to the Government, and that the equipment at the Speedway can be used for whatever purpose the Government might see fit. Nothing definite has been received yet as to whether the board will accept the offer.

New Type Goodyear Kite Balloon

A most unusual use for an automobile was found by The Goodyear Tire & Rubber Company last week. The occasion was the final test of a perfected type of "kite" or "captive" balloon, which Goodyear has been building. The name "kite" balloon refers to the method of rigging which is similar to that of a boy's kite. The balloon is let up into the air at the end of a wire cable and held at any height desired.

In the Goodyear test last week this wire cable was passed over a drum, and power transmitted to the drum from the rear wheel of the automobile, allowing the balloon to be raised and lowered as desired.

These "air sentinels" are used primarily for spotting artillery fire and for general observation. They have been called the "eyes" of the army and navy. Their general purpose is to keep a watch on the whole fighting front. This is true both at sea and on the land.

The Goodyear kite balloon as now developed operates under practically any weather conditions, and will not pitch, roll or yaw even in a stiff gale. Goodyear officials are highly pleased with the splendid results of last week's test, which was conducted under the observation of representatives from two foreign governments, and one each from the U. S. Army and the U. S. Navy. The balloon is 81 feet in length, while its largest diameter is 22 feet. Hydrogen gas is used in inflating the big sausage-shaped bag. By a simplified process of generation the gas may be obtained whenever desired through the use of a hydrogen generator.

Goodyear was the first of the great rubber companies to become interested in aeronautics, just as she pioneered many of the tire improvements which have helped to popularize the motor car and usher in the era of the owner-driver.

For several years Goodyear has made everything in rubber for the aeroplane and balloon. Goodyear Aeroplane Tires have long been standard equipment on aeroplanes used by the United States Army and Navy. All of the machines now being used by General Pershing in Mexico have Goodyear tire equipment.

At the last international balloon race held in Paris in 1913 the famous James Gordon Bennett Cup was won by the balloon, "Goodyear," piloted by Goodyear's aeronautical expert, Ralph H. Upson. This balloon is still in prime condition notwithstanding the many flights which have been made since. The rubberized fabric in the new kite balloons is of the same quality and sturdiness as that used in the winner of the world's championship.

The position of the Goodyear Tire & Rubber Company in the aeronautical field is indicated by the fact that two United States Navy officers were recently detailed to the Goodyear factory to receive instruction in the operation of balloons. The government is now using both spherical and kite balloons of Goodyear manufacture.

Lieut. Sullivan Back from the Front

Lieut. Willam Francis Sullivan, Newport, R. I., a graduate of the Curtiss School at Hammondsport, New York, who left for the front early in December, 1915, has just returned to this country after some thrilling experiences on the French war front. Mr. Sullivan went to Northolt, England, where he enlisted in the British Royal Flying Corps. After three and a half months of preliminary work there, he was given his commission and sent to France. He was assigned to headquarters at St. Omer, France, where for quite a period he did night flying and reconnaissance work. He was under fire a hundred times while flying near the German trenches, but luckily he escaped without injury. Mr. Sullivan has offered his services to the War Department and to the National Guard of Rhode Island, believing that the experience which he had been able to secure in Europe should be available for our Government if necessary.

Sperrys Invent Wireless Unit

Uncle Sam has succeeded in outstripping other nations in at least one branch of army service—that of wireless instruments for aeroplane reconnaissance. Compressed into a little package that an aviator might almost stick into his pocket is a new wireless instrument capable of carrying messages for sixteen miles, and weighing only seven pounds.

The device is the invention of Elmer A. and Lawrence B. Sperry. According to Henry A. Woodhouse, member of the board of governors of the Aero Club of America and director of the American Society of Aeronautic Engineers, the miniature wireless will revolutionize the use of such instruments and will give the nation which controls its use a marked advantage.

"Heretofore, radio sets have weighed from two to four pounds for every mile radius," said Mr. Woodhouse. "It always has been thought that an ideal set would be one that would weigh one pound for each mile radius. This instrument, as it has been shown, has far outstripped even the hopes of other inventors, and the most hopeful part of the discovery is the fact that its radius may be increased with but a proportionate increase in weight."

Aero Squadron in Buffalo Parade

The Buffalo Aero Squadron was represented in the Citizens' Preparedness Parade held on June 24th. The Division was under the command of Capt. John M. Satterfield.

Chicago News

On Thursday, June 22nd, Miss Katherine Stinson tried out her looper tractor after the machine had undergone a two weeks' overhauling under the direction of mechanician Schroeder. The motor ran better than it has done in a long period and took the big tractor up at a steep angle. Miss Stinson flew twice. The flights were made on the ground of the Aero Club of Illinois old flying field at Cicero.

Mr. Louis Guertson, pilot of the Marks military tractor, has returned to the flying field at Ashburn with his machine.

Mr. Sinclair, who has been out on the road, returned to the field during the past week with his Stupar tractor.

The Partridge Co. has secured a new Kirkam for school purposes and will install the motor soon.

Miss Majoris Stinson, of San Antonio, Texas, is coming to Chicago to fill a date on the Fourth at Chicago Heights.

A. B. Lambert Goes to Chicago

Mr. A. B. Lambert, the well-known St. Louis sportsman and aviation enthusiast, will go to Chicago to confer with a special committee of the Aero Club of Illinois upon the best way of arousing the government to the necessity of establishing immediately an aerial reserve training station in the Middle West.

Aeroplanes Sent to Pershing

Aeroplanes for scouting purposes were sent south from Columbus on June 24th on imperative orders from General Pershing. The planes are the new 160-horsepower type and each carried a pilot and an observer.

For about six weeks new aeroplanes have been under process of assembling here preparatory for field use. Some delay has been occasioned by the failure of proper propellers to arrive.

New Des Moines Aeroplane Co.

The Des Moines Aeroplane and Motor Co. have organized for the purpose of dealing in aerial supplies and also the manufacture of machines. At the present time they have under development an aero engine which it is expected will develop approximately 300 h.p. and weighing about 400 pounds.

TESTIMONIAL TO ORVILLE WRIGHT

A DINNER was given to Orville Wright at the Engineers' Club in Boston by the Massachusetts Institute of Technology during the Dedicatory Exercises of the new buildings which have just been completed in Cambridge. Mr. Wright and Mr. Alexander Graham Bell were the guests of honor at the Dedication, in recognition of their great achievements in applied science.

Although the dinner was informal and the speaking was carried on across the table, it was recognized as one of the most interesting aeronautical meetings ever held, owing to the number of distinguished scientists who gathered to honor Mr. Wright.

It was a recognition by Technology of the debt science and civilization owes Orville Wright and his brother for their epoch-making discovery in 1903, and it was a modest tribute to their genius from some of the men in the United States who have done much to advance the science of aeronautics.

Professor C. H. Peabody, the head of the Department of Naval Architecture, and under whose supervision the course in aeronautics at the Institute is conducted, presided, and asked several of the distinguished guests to relate some of their experiences in connection with the Wright's early work.

Mr. Alexander Graham Bell told of his early experiments in aeronautics and of his long-standing interest in the subject through the investigations he had made of the work of Lilienthal, Pilcher, Adler and others. He spoke of his pleasure in hearing the news of the first work of the Wright Brothers at Kitty Hawk. At that time few would believe that the problem of dynamic flight had been solved, but as he knew that it was near solution, he was prepared to believe it and announced publicly his belief in the Wrights.

The first Wright machine on exhibition at the Mass. Institute of Technology.

Mr. Wright paid Mr. Bell the compliment of saying that, in his opinion, Mr. Bell was the first man of scientific standing to publicly express his belief in their success. Mr. Wright told of the difficulties that were encountered in this country of securing recogniton, and how they had offered their patents to the world for $100,000, but without result. He told of their difficulties in the first experimental work. He smiled when he said that the first time an aeroplane had risen from the ground without a starting device was due to the fact that during an exhibition given for the King of Spain, their machine landed on slippery grass and kept going so well that they tried and succeeded in getting off without their starting weights. Many other personal incidents connected with Kitty Hawk were related by Mr. Wright. He told how he and his brother had become interested in aeronautics through reading the experiments of Lilienthal in a little aeronautical journal published at his own expense, and merely to further the interest in flying by one of the guests present, Mr. James Means, in the years 1895, 1896 and 1897.

Mr. Means then told of how he became interested in flying through the bicycle about 1880, and how surprised he was to find that so many persons in this country and Europe were working on the problem. This study and collection of facts led him to publish *The Aeronautical Journal*, from which the Wrights secured their first scientific data.

(*Continued on page* 488)

RUBBER IN THE CONSTRUCTION OF AEROPLANES

THE balloon has not received as much attention in America as in Europe. Americans have never believed that it would become really practical, and heavier-than-air machines have possessed more attraction for our inventors. The problem of mechanical flight has given birth to many chimerical plans and projects, but the fact remains that, although most of the earlier theoretical literature on the subject came from France, practical results with machines heavier than air were first obtained by Americans.

As far back as 1894 Hiram Maxim, an American residing in England, constructed a flying machine, provided with a steam engine, which showed flying capability but lacked stability. Professor Langley, secretary of the Smithsonian Institution at Washington, built several working models of flying machines propelled by steam engines, of which two, in 1890, made aerial flights of about a mile. Then followed, also in America, the remarkable "gliding" experiments of Lilienthal, Chanute, Herring and finally of the Wright brothers, who, as far back as 1902, had completed gliders possessing most of the refinements of modern aeroplanes, minus the motor. Since Wilbur Wright made his historical flight in 1908—the first mechanical flight worthy of the name—gigantic strides have been made toward perfection in navigating the atmosphere with machines heavier than air, and thousands of successful aeroplanes of many types have been produced. The flying machine has proved its value both as a vehicle of sport and as an instrument of war. The new industry has been growing rapidly all over the world. Forty American aeroplane factories are now working full force on foreign government orders for flying machines, and consequently it seems quite worth while to go somewhat into details concerning this industry and the extent to which rubber is used in the construction of aeroplanes.

Aeroplane Construction

There are four important ways in which rubber is used in the construction and use of aeroplanes: First, in the pneumatic tires with which the wheels are equipped; second, in the rubberized fabric for covering the wings and other surfaces; third, in the construction of shock absorbers, and fourth, in the equipment of the aviator and passengers.

All aeroplanes — some water-aeroplanes excepted — are equipped with wire wheels similar to motorcycle wheels and provided with pneumatic tires which are either cemented, glued or attached with lugs to the rims of the wheels. The Dunlop type of tire is most favored for aeroplane service on account of the facilities it offers for light construction. The size of wheels and tires varies with the type of machine. Aeroplane tires must be attached very tightly to their rims, for the slipping off of a tire is even more dangerous to an aviator bringing his machine to earth than it is to an automobilist taking a corner on the road. Aeroplane tires must have great resiliency and strength of fabric to withstand the terrific shock when an aeroplane alights on rough, uneven ground. A blow-out at such a moment might prove fatal. The plain tread is perhaps most used, although aeroplane tires are also made on the non-skid plan. The tire and the rims of the wheels of aeroplanes should be constructed so as to make rim-cuts impossible even when the landing shock flattens out the tires.

Aeroplane Fabrics

Fabrics play an important role in aeroplane construction. As long as the cloth covering the sustaining planes of a flying machine stays taut in all kinds of weather, little attention is paid to it, but when it alternately shrinks and stretches, when it shows itself as sensitive as a hygrometer to the presence or absence of atmospheric moisture, aviators and aeroplane constructors soon realize the importance of aeroplane cloth. The quality of the cloth affects the efficiency and even the safety of a flying machine. Aeroplane cloth must be moisture-proof, heat-proof and cold-proof, and it must not oxidize in the sun or become affected by gasoline or engine oil.

The following fabrics are used in the construction of aeroplanes: Cotton canvas, either unbleached or colored in yellow, and weighing from 145 to 150 grams (4.90 to 5.07 ounces) per square meter (10.764 square feet), is used single-fold for covering the sustaining surfaces of flying machines. The tensile strength of this canvas is from 2,200 to 2,800 pounds per running yard and its thickness about 0.18 millimeter (0.007 inch). Some constructors use cotton canvas weighing from 180 to 200 grams (6.34 ounces to 7.05 ounces) per square meter (10.764 square feet), having a tensile strength of about 2,600 pounds to the running yard and a thickness of about 0.18 millimeter (0.007 inch). Flax fabrics or linen are most used. Linen fabrics weigh about 145 grams (4.90 ounces) to the square meter (10.764 square feet) and their tensile strength is in the neighborhood of 3,600 pounds to the running yard or 18.80 pounds to the square millimeter (0.00155 square inch), while their thickness is around 0.20 millimeter (0.0078 inch). Silk fabrics, though stronger than others for their weight, are not used in the construction of aeroplanes on account of their excessive cost.

French constructors use quantities of ramie fabric. This weighs 120 grams (4 ounces) per square meter (10.764 square feet), its tensile strength is 2,120 pounds per running yard, or 13.64 pounds per square millimeter (0.00155 square inch), and its thickness 0.17 millimeter (0.0066 inch). Ramie fabrics are very tough and hard to tear.

Making the Fabric Moisture Proof

Rubberized fabrics were used almost exclusively for covering the sustaining surfaces of the first aeroplanes, but the rubber industry had been taken unawares and the rubberized fabrics then obtainable were not well suited for the requirements of aeroplane construction and they soon fell in disfavor because the best of them absorbed a certain amount of humidity, stretched, and thus lost their rigidity. Canvas, coated with acetate of cellulose, took the place of rubberized fabrics in the construction of aeroplanes because such canvas is supple and at the same time little affected by the weather. The plain canvas was first stretched and fastened tightly to the frame of the machine and then coated with acetate of cellulose varnish. Acetate of cellulose applied in the form of a collodion tightens cloth that is stretched on a frame; it makes the cloth waterproof without making it stiff and brittle as nitrocellulose does; it does not crack and it is not inflammable. Acetate of cellulose varnishes used in the early days of aviation were diluted with chloroform, but this solvent was soon dropped on account of its high cost and the danger in its use. At the present time two sorts of acetate of cellulose varnishes are used—varnishes that give a rigid coating and those that give supple coatings.

Rubberized Fabrics

The use of rubberized fabrics in the construction of aeroplanes is not so extensive as it is generally believed to be. Aeroplane manufacturers and aeroplane users are still under the influence of the prejudice developed in the early days of aviation when proper rubberized fabrics for this purpose were not to be obtained. The fabrics available in the pioneer days of aviation were rubber-coated and not impregnated with rubber as they are now. The result was that the rubber coating cracked and peeled off, allowing moisture to penetrate the fibre of the fabrics, causing them to alternately shrink and stretch. Modern rubberized aeroplane fabrics present no such difficulties, and aeroplane builders are now beginning to give them the consideration they deserve.

Rubberized balloon fabrics are made either of linen or of cotton and they are thoroughly impregnated and saturated with rubber applied gradually by a series of operations. Manufacturers have learned to make them absolutely weatherproof and lasting. Besides being thoroughly saturated with rubber, modern rubberized aeroplane fabrics are generally coated with rubber solution on both of their surfaces. These coatings are so light that rubberized aeroplane fabrics are no longer open to objections on the score of weight as was formerly the case. The process of preparing these fabrics is quite similar to that used in the preparation of balloon fabrics already described in a preceding article on the subject. Aeroplane fabrics are made in all colors or, like some of the balloon fabrics, are metalized with aluminum.

Shock Absorbers

All aeroplanes are provided with a running gear which invariably includes a system of shock absorbers built to protect the machine as well as the aviator from too violent shocks when leaving and when returning to earth.

The Bleriot type of rubber springs or shock absorbers was at first built up of fine rubber strands bundled together, covered with a cotton fabric, the ends of the strands being firmly held in metallic clamps constructed in such a manner as to facilitate the fastening of the spring to the landing gear of the aeroplane. It was, however, discovered that the fine rubber strands soon decayed from oxidation and their place was taken by molded rubber vulcanized to give proper tensile strength and elasticity.

The Farman type of aeroplane spring is used in attaching

the axle on which the wheels are mounted, to the skids of the flying machine. Two or more rubber rings are hooked to one side of the skid, then brought over the axle and fastened to the other side of the skid. These rings are made of either red or of bluish-gray stock compounded so as to be strong enough to withstand heavy strain and with the exact degree of elasticity to allow proper elongation and no more. These types of rubber shock absorbers vary widely with the type of machine and of landing gear used. For aeroplane shock absorbers rubber is unrivaled on account of its light weight and extraordinary elasticity. Metal springs, hydro-pneumatic shock absorbers and the like are used but not nearly to the extent that rubber is.

Equipment of the Aviator

Aviators, when flying, use rubber and rubberized fabric cloths almost exclusively. These are made in all colors and afford perfect protection against weather. Aerial waves make riding in an aeroplane comparable to riding a bucking bronco, and aviators are obliged to fasten themselves to their seats lest they be thrown out by the violent bounding of their machines.

Here again rubber is used in the shape of a rubber belt which the aviator passes around his waist and fastens to the machine with leather straps. Such a belt not only prevents the aviator from being thrown out of his machine, but in case of accident the elasticity of the rubber acts as a fall-breaker. This type of rubber belt is generally composed of two pieces held together by a miniature coupling pin. By pulling out the coupling pin the flyer can immediately free himself from his machine.

Many aviators use hard rubber helmets to guard their heads in case of accident and rubberized gloves to protect their hands and forearms from cold and rain. As in dirigibles, the navigating instruments used in aeroplanes are generally held in place by soft, elastic rubber attachments which prevent excessive vibration and violent shocks reaching the delicate mechanism of these instruments. The upholstering of aeroplane seats is often made of rubberized fabric inflated with air. Aviation, like aero-station, presents numerous and extensive applications of rubber and offers an interesting field to the rubber manufacturer, and one that may in the future grow into much larger proportions and become of still greater importance.

GERMANS COPY GNOME AEROPLANE MOTOR

(Courtesy *The Automobile*)

CONTRARY to the general impression, the use of rotary air-cooled motors is by no means confined to French aviation. The German army employs the Oberursel nine-cylinder air-cooled rotary motor on practically all Fokker scout monoplanes. The Oberursel is a direct copy of the French Gnome aeroplane engine, while the Fokker aeroplane is a repetition of the Morane machine. With the exception of her Fokkers, Germany fits all her aeroplanes with vertical water-cooled motors. A few of these are six-cylinder overhead valve Benz, with vertical pushrods and rocker arms; the great majority are Mercedes engines with inclined overhead valves operated by a single overhead camshaft. Mercedes began to develop this type of engine in 1912, and in order to make more rapid progress employed the same general design for both aviation and automobile racing. These motors are produced under the direction of Heinrich Haeder, head of the aeroplane and racing departments of the Mercedes company, who has as his assistant the race driver and Engineer Seiler, who ran in the last French Grand Prix at Lyons. The latest Mercedes production is a six-cylinder motor of 5.5 by 6.29 in. bore and stroke developing 178 h.p. at 145 r.p.m. All these motors have separate steel cylinders with sheet steel jackets common to a pair of cylinders and a pair of valves inclined in the head; it is only in the racing type that four valves are employed.

Steel Cylinders Common

Steel cylinders have become very common not only in German aviation but among the Allies since the success obtained with them by Mercedes, and indications are that this type of cylinder will be largely adopted for racing and high efficiency car motors after the war. The construction is not costly, there are very few manufacturing difficulties, the combustion chamber is machined all over, water circulating space can be carefully verified, and the design is lighter than block cast cylinders. In most cases cast-iron pistons are used; but several manufacturers are designing these motors to run at 2400 r.p.m. instead of 1200, with the propeller geared down at a 2 to 1 ratio. This has necessitated lighter reciprocating parts and a considerable amount of successful experimental work has been done with aluminum pistons.

In the German army much importance is attached to uniformity of design and construction. Thus, motors are invariably mounted in the front of the fuselage, with the tractive screw on the propeller shaft and, of course, running at engine speed, which never exceeds 1400 r.p.m. During the early months of the war the radiator was mounted on each side of the fuselage; this, however, was an exposed position, any stray bullet being liable to break a tube and cause the total loss of cooling water. More recently the radiators are of the honeycomb type, very similar to those used on cars, mounted in the center of the upper plane, with the head inclined considerably toward the rear. The entire cooling surface, which measures 6 meters 80, is above the top of the engine, instead of being below it as on the old type, and the maximum protection is obtained against stray bullets. All German motors, whether Mercedes or other make, are partially silenced, the exhaust gases being drawn into a collector, and the exhaust pipe carried upward and inclined to the rear to a point slightly above the top of the upper plane. With the exception of the Fokker all machines are biplanes.

No German V Engines

Germany appears to have paid no attention to V motors. This can be understood in view of her passion for uniformity. Before the war a very satisfactory type of vertical six-cylinder water-cooled motor was evolved, and the German authorities have remained faithful to this type during the war. The French, on the other hand, have refused to be bound by a mediocre uniformity, and in the midst of the war have not hesitated to give engineers a free hand and adopt the best that they could produce. Thus, the 20 months of war have seen the decline of the rotary and the rise of the six-cylinder vertical and various eight- and twelve-cylinder V motors. The rotary has not been abandoned, for recently there has been a rise in favor of the Rhone engine. This motor, originally a rival of the Gnome, was brought up by the Gnome company 2 or 3 years ago and produced by them. It has been found more satisfactory than the original Gnome and is being built in bigger quantities than the Gnome.

Goodyear and Preparedness

In many ways Goodyear has aided the United States Government in its preparedness program. Recently two United States Navy officers were detached to the Goodyear factory to receive instructions in the operation of both spherical and kite balloons. All free spherical balloons and kite balloons owned by the Government were designed by Goodyear engineers and made in the Goodyear factory.

Perhaps the most noteworthy triumph of Goodyear in the military aeronautic field has been the perfection of the kite or captive balloon. The Goodyear kite balloon operates under any weather conditions and remains steady even in a stiff gale, permitting the use of the most delicate instruments in making military observations. The distinction of furnishing the United States Government with its first kite balloon fell to Goodyear. To enable the aeronaut to escape with his records in case of accident, a parachute has been perfected which is a modification of the type with which the public is familiar.

About five years ago Goodyear began to develop tires to fit the peculiar requirements of the aeroplane, which have performed so efficiently as to be adopted as standard equipment by the United States Signal Corps.

Radium Luminous Material Corporation

The Radium Luminous Material Corporation of New York City, announced that they are experimenting with a new method of lumination for instruments used on aeroplanes. This company has been furnishing the Government with their Radium Luminous Material through their various instrument contractors for some time, and they have been endeavoring to find a way for illuminating all of the instruments on the aeroplane instrument board and to have its use adopted by the Government. The Government specifications called for a material guaranteed not to deteriorate for at least two years, but the Radium Luminous Material Corporation state that their product under ordinary conditions will last at least ten years.

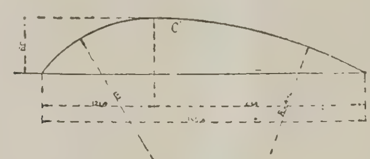
VARIABLY-CURVED PLANES

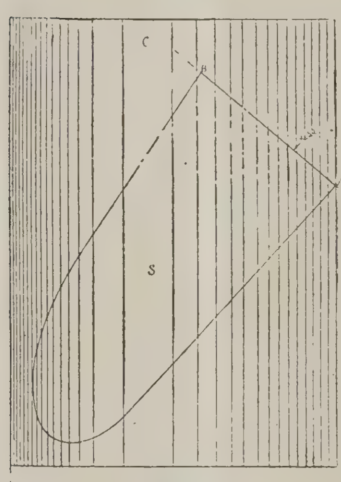
By W. L. M.

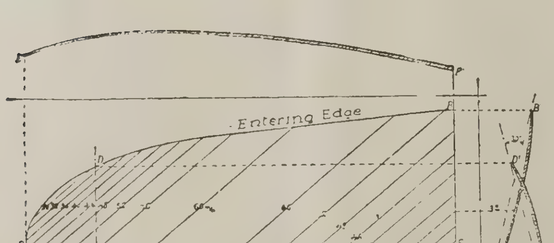
The following is a translation of an article from the pen of M. Robert Mallet which appeared in a recent issue of "L'Aérophile," and has been translated by the editors of London "Aeronautics."

I HAVE often discussed with my friend Olivier de Montalent questions relating to stability, and it is in memory of him that I have here collected various observations which deal with the subject.

Progress in the development of aviation has during the last few years chiefly been directed towards increase in efficiency, and the improvement of speed and weight-carrying capacity has been the principal aim of designers. This process of evolution is perfectly natural, as the aeroplane is pre-eminently a military appliance, for which purpose the factors of speed and load are of primary importance.







But in considering the question of flying it would seem that insufficient attention has been paid to adapting the aeroplane to the medium in which it moves, which is essentially tenuous and yielding. The means placed at the disposal of a pilot to meet gusts and "remous" are, in the main, purely mechanical, and frequently necessitate the expenditure of considerable energy, resulting in fatigue, which has been the cause of many accidents.

Attempts have been made to provide automatic stabilizing appliances to assist the pilot; but, though some of these operate with a certain measure of success, they do not seem to have given the results which have been hoped for.

It would appear more natural to seek for stability in a form of wing which would facilitate the work of the pilot and tend to restore equilibrium independently of the controls.

The tail portion plays an important part in achieving this end; but it is evident that safety would be increased if the wing form itself contributed. In an endeavor to arrive at this result the writer has made numerous experiments with planes which may be described as variably-curved planes. This term is not absolutely exact, for in this article a number of geometrical surfaces will be considered; nevertheless, it is convenient and describes with tolerable accuracy the appearance of wings which are analogous to surfaces permanently subjected to warping.

In a previous communication these wings were described under the name of "surfaces with oblique generatrices" (*L'Aérophile*, November 15, 1911), meaning that the surfaces are cylindrical and that their generatrices are disposed at an angle to their flight-path.

I commence with the study of cylindrical surfaces because they are the easiest to design and construct, but there are a whole series of other surfaces, which I have been unable to consider for lack of time. These are true variably-curved surfaces, which may be represented by curves showing the variations of camber, but which it is impossible to describe by means of straight lines in a diagram, as can be done with surfaces projected on cylindrical or conical models.

The experiments have been conducted throughout with models in free gliding flight. I attach great importance to trials made in the open air and, above all, in wind, and it is in such conditions that the superiority of warped surfaces over surfaces of ordinary curvature is most noticeable. I have also experimented with towed models in cases where the span exceeded 2 metres (6.5 ft.). The smallest models used were of about 30 centimetres (11 in.) span and were constructed of sheet aluminum, but the larger models, measuring more than 1 metre, were made of wood covered with fabric.

Aluminum models possess the great advantage that they can be used a number of times without becoming damaged, and it is extremely important to carry out a number of flights in order to obtain comparisons of the behavior of the same models under varying atmospheric conditions and also to contrast them with others.

Experiments in the Eiffel Laboratory

It was most interesting, after having settled the improved stability obtained by the employment of these models, to experiment with them in a laboratory.

M. Eiffel was kind enough to carry out the tests, and the following description and the accompanying diagrams have already appeared in his treatise on "Aerodynamics" (*"La Resistance de l'Air"*)

The models tested by M. Eiffel were of three-ply wood molded on a cylindrical surface, the wing being trapezoidal in form with the tips rounded off and the entering edge inclined backwards.

The wing is cut from a portion of a cylinder, *CC'*, the section of which was determined by describing two circles cutting one another, having radii of 152 millimetres (6 in.) and 490 millimetres (19¼ in.) respectively, and such that the subtending chord had a length of 355 millimetres (14 in.), while the maximum ordinate measured 60 millimetres (2-1/3 in.) (*Fig.* 1).

The horizontal projection of the wing pivoting around the point A can take such a position that the generatrices of the cylinder form any angle x with the straight edge AB at the root of the wing. When $x = 90°$ one has an ordinary cambered wing, but as x becomes more acute the wing has a greater variation in curvature.

Experiments have been carried out with three wings formed by making $x = 90°$, 70° and 50° respectively. In Fig. 2, which represents the plan of these wings, generatrices of the cylinder have been superposed corresponding to constant variations of level of 4 millimetres. The generatrix numbered zero is that which passes through the pivotal point A. In the same figure two sections, taken at the points AB and CD of the wing, are given showing that they have a differ-

ence in incidence of 30°. A third sketch gives an idea of the appearance of the wing viewed from the front.

Fig. 3 represents the comparative positions of the centers of pressure of the three wings. The angles given are the angles which the wind makes with the chord of the middle section of the wing. It will be noticed that with these variably-curved surfaces the center of pressure follows the same law as if the wing were a flat plane, and that the travel of the center of pressure, even with a considerable alteration of incidence, is very small. Thus for a depth of wing of 185 millimeters (7½ ins.) in a change of angle from 5° to 15° the c.p. only travels from 82 millimeters to 90 millimeters (3¼ ins. to 3½ ins.); the amount of travel being only 8 millimeters, or about 4 per cent of the chord of the wing. On the other hand, for the 90° wing the travel of the c.p. follows the ordinary path usual in a cambered wing.

The polar curves of Fig. 4, giving the values of Kx and Ky, show that the wing with the greatest variation in curvature is the least advantageous dynamically. It is probable, however, that if an intermediate angle of 80° were to be taken one would have a polar curve very similar to that of the 90° wing while continuing to reap the benefit of the small travel of the c.p.

An examination of the top surface of the wing by means of attaching a series of very light silk threads reveals that the flow of air currents is actually at right angles to the general trend of the air, as the threads are sharply deflected over the whole of the rear portion of the wing (Fig. 5). When fastened to the lower surface the threads behave normally and there is only a slight deflection at the extremity of the wing, which does not appear to be greater than is present with ordinary surfaces, where it almost always exists. It is believed that this phenomenon has not been noticed before.

Longitudinal Stability

The curves of Fig. 3 clearly show the longitudinal stability inherent in the surfaces tested. This stability springs from two causes:

1. The variation of incidence along the whole span of the wing.

2. The setting back of the entering edge relatively to the direction of motion.

The variation of incidence is insufficient of itself to assure stability; but it can in certain cases reduce the travel of the c.p.

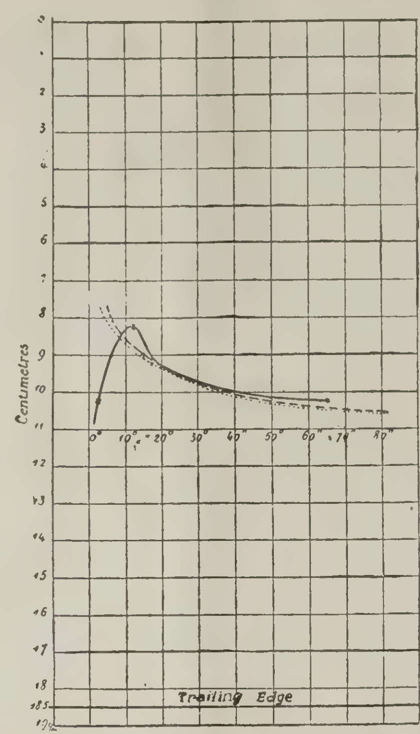
Let us consider the case of an ordinary rectangular wing, $ABCD$ (Fig. 6). The travel of the c.p. for the different angles of incidence follows the well-known curve MON. Now let us take a warped wing, $A'B'C'D'$, of the same plan form as the other. It may be considered as being composed of the sections $A'B'a'b'$, $a'b'a''b''$ .... $c'd'C'D'$. Each section will have its c.p. on the curve MON, since the profile is the same as that of $ABCD$. Now let us imagine that the variation of incidence along the wing $A'B'C'D'$ is such that for a position M of the c.p. of the section $A'B'a'b'$ the end section $c'd'C'D'$ will have its c.p. situated at a point O, the summit of the curve MON. The c.p.'s of the different sections will lie, then, along the curve MON.

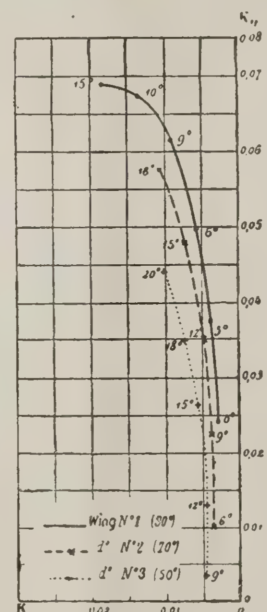
By joining the c.p.'s of the different sections on the figure $A'B'C'D'$ we shall have a curve, X, representing the position c.p.'s for one position of the wing. If, now, we alter the angle of incidence so as to bring the c.p. of the section $c'd'C'D'$ to a point, N, the c.p. of the opposite section, $A'B'a'b'$, will be in a position near O, and we shall have a new curve, X', almost symmetrical with the first, which shows that in this particular instance the c.p.. of the whole wing, $A'B'C'D'$, will scarcely be moved. But this particular case is insufficient to explain curves 2 and 3 of Fig. 3.

However, it will be found that the variation of incidence, combined with the set-back of the entering edge, makes the wing combine within itself the properties of a tail. Fig. 2, which is an exaggerated example of the variably-curved wing form, clearly shows this.

The longitudinal stability is most appreciable in spite of the small slope of the entering edge. I have tried a great number of models, consisting simply of the supporting surfaces, and have found that surfaces of a form similar to Fig. 1 and suitably ballasted provide a perfectly stable system which recovers its balance after being released in any position. These tailless systems frequently give the best results in disturbed air.

Dr. Raymond (who was, unfortunately, killed on active service recently—Translator) has remarked with reference to the interesting experiences of Pegoud, that it is easier to





overturn a machine longitudinally than it is to right it when it is on its back; but with warped surfaces the contrary is the case, which is evidence of increased safety.

Fig. 7 is a diagram of a wing tested on a model of 4.50 meters span. This monoplane model was towed behind a boat at a rate of about 40 k.p.h. Experimenting over land with models weighing as much as 15 or 20 kilos is not to be recommended as they get broken so easily.

In Fig. 7 is shown the plan form of a wing modeled on a cylinder, of which AOB is the horizontal projection. On this are placed ribs of identical shape and described n, n', n'', etc. These ribs determine the surface of the wing and make the angles a, a', a'', etc., with the wind, the angles becoming more acute in proportion to the distance from the center. The entering edge is swept backward, as in the models tested at the Eiffel laboratory. The method of construction adopted was that employed in naval architecture; the ribs are put in place like the frames of a small boat and connected by cross-braced longerons, so forming a rigid structure with good transverse curvature.

(To be continued)

UNIVERSAL ILANASILK AVIATOR'S LIFE PRESERVERS

The recent adoption of the Universal Ilanasilk life preservers by the U. S. Steamboat Inspection Service has proven of considerable importance and interest to aviators as it makes it permissible for them to now use the Universal type for all occasions. The law requiring life preservers for motor boats was held by the Government Inspectors to also apply to hydroaeroplanes. As a result, aviators either had to carry a cork belt, or run the risk of fine when carrying a passenger.

Lieut. S. P. Edmonds, U. S. Coast Guard, Retired, has succeeded in developing a life preserver that is manufactured by the Robinson-Roders Company, of Newark, N. J., which was adopted on April 3, 1916, by the Steamboat Inspection Service. *As a result the aviator can wear the Universal Ilanasilk aviator's life preserver, specially designed for such use, while the passengers wear the less expensive type as authorized* (Ship Life Preserver).

These aviator's life preservers are extensively used by both the Navy and the Army aviators as well as others, and a number of lives have already been saved by their use. The object is to support the head of stunned or unconscious person above the water in case of fall, until rescued. Without this life preserver, the fallen aviator is liable to drown as soon as his head reaches the water. Some of the aviators lost in this way were found to be otherwise uninjured and would have in all probability been saved if provided with the life preserver. Flying over water is far safer than over land when the aviators wear these life preservers. In fact, it would seem that training and amateur flying should all be done over water, even when land machines are being used. The fall in case of accident is very much less injurious when striking in the water; the machine takes a large part of the shock, and if the flier is wearing our Universal life preserver, his chances are fair for rescue. These Ilanasilk equipments have just been awarded the *Grand Prize* by the Exposition of Safety held under the auspices of the American Museum of Safety and Sanitation.

Aviators Pin Faith to Western Spruce

Aviators of France and Great Britain pin their faith in Northwestern spruce, according to Robert B. Allen, of the West Coast Lumberman's Association, who spoke to students of journalism at the University of Washington. More than a million dollars have been spent by these Allies for spruce from Oregon and Washington, which is considered as the most satisfactory wood obtainable for aeroplane construction.

The two countries have taken 18,000,000 feet of spruce since the war began, Mr. Allen said, and they have been so insistent on getting this wood alone, that when bottoms were unavailable on this coast the shipments have gone by rail to New York and Boston, thence to the Gulf and then to Europe. At the war's beginning this wood brought $45 a thousand, but the price has advanced markedly since that time.

THE DEVELOPMENT OF ENGINES SUITABLE FOR AERONAUTIC SERVICE

Origin—Means Used, and Results

By CHARLES E. LUCKE

(*Continued from page* 397)

The aggregate weight of all the units of the power plant, engine, engine accessories and supplies can be represented algebraically or graphically with every element involved in correct relative magnitude. All of these weights are constants for each engine, except the gasoline and oil weights, which are products of consumption per hour and the length of the run. Accordingly, the graphic representation will be a series of straight lines or of the aggregate, a single straight line. Algebraically the equation of that line will contain two constants, each of which is the sum of similar constants, one representing intercepts on the axis of zero time and the other slopes. In order to keep the various elements of the aggregate weight distinct and to bring out clearly the big factors of weight of engine proper and of gasoline weights, it is desirable that the excellent arrangement of a single line for each engine used by Bendemann in the second German report be supplemented by a general equation involving all the constants and a table of values for each as derived from the tests. Such an equation will have the following form:

$$\left.\begin{array}{l}\text{Weight of plant complete with}\\ \text{tanks full for } H \text{ hours' run,}\\ \text{pounds per horsepower.}\end{array}\right\} = \left\{\begin{array}{l}\text{Weight of engine alone per horsepower.}\\ +\text{Weight of gasoline tank per horsepower.}\\ +\text{Weight of oil tank per horsepower.}\\ +\text{Weight of radiator per horsepower.}\\ +\text{Weight of water per horsepower.}\\ +\text{Weight of muffler.}\end{array}\right. + \left\{\begin{array}{l}\text{Pounds gasoline per hour per horsepower}\\ \text{Pounds oil per hour per horsepower}\end{array}\right\} H.$$

Symbolically this takes the following form with corresponding meaning from the former equation:

$$W = W_e + W_{gt} + W_{ot} + W_r + W_w + W_m + (G + O)H$$

In the following Table II are given some typical values for those seven constants, derived from the tests and for the total W for 0 and 10 hours. The gasoline and oil weights are added for 15 and 20 hours, but the plant weight can not be so given because of the uncertainty of the tank weights, which naturally are not directly proportional to content weights. It is interesting to note, however, that in 10 hours the plant weight is doubled—that is, the supplies for that time equal the weight of the plant empty for water cooled fixed cylinder engines. The air cooled rotating cylinder engines in the same time of 10 hours more than quadruples the weight.

Typical arrangement of cylinders, pistons, jackets, frames, crank shafts, valves, valve gear, and typical structural forms of each, have been produced in great variety and in considerable numbers. Of these a fair number have received more or less development work, but the majority of them must be regarded as hardly more than interesting proposals, or experiments in need of development work to definitely reject or retain them for use. Features of detail will be treated later in the course of the analysis of the engine after a review of the types classified by general arrangement.

Most of the engines operate on the four-stroke cycle, though the two-cycle system is represented, both air and water cooling is used, and of the air-cooled class there are representatives of self-cooling by rotation of cylinders, by fan circulation and by propeller blast, or free air currents over fixed cylinders. All engines are multicylinder, four or more, and generally more, and while nearly all use horizontal shafts with direct or spur-gear propeller drive, the vertical shaft with bevel-gear drive of propeller is represented.

These types, classified by cylinder and crank arrangement, are as follows:

1. Automobile type, four or more cylinders in line, each with its own crank, cylinder heads up. Air or water cooled.
2. V type, two rows of cylinders of four or more each, inclined to each other, one crank for each V pair of cylinders. Air or water cooled.
3. Radial star rotating cylinders, with crank shaft fixed, or rotating in the same or opposite direction. Air cooled only.
4. Special arrangement or combinations of the preceding.

Of these classes the first three are the most typical of the aero engine art in point of numbers of representatives, amount of development work done on them, and of standing in the engine-building industries of the firms represented, as will be seen from the following list of names of engines and makers, Table III, arranged under each class heading. This is not

to be regarded, however, as a criticism of any of the other classes.

CLASS 1.—*Automobile class.*

Water cooled:
- American—
  - Hall-Scott.
  - Sturtevant.
  - Wright.
- German and Austrian—
  - Mercedes (Daimler).
  - Austro Daimler.
  - Benz.
  - N. A. G.
  - Argus.
  - Mulag.

Water cooled—Continued.
- German and Austrian—Continued.
  - Schroeter.
  - Basse & Selve.
  - Flugwerke Deutschland.
- French—
  - Clerget.
  - Chenu.
- Britiish—
  - Argyll.
  - Green.

CLASS 2 V.

Water cooled:
- American—
  - Curtiss.
  - Sturtevant.
  - Ransenberger.
  - Maximotor.
- French—
  - Panhard-Levassor.
  - Clerget.
  - Laviator.

Water cooled—Continued.
- British—
  - Sunbeam-Coatalen.
  - Wolseley.

Air cooled:
- French—
  - Renault.
  - De Dion-Bouton.
- British—Wolseley.

CLASS 3.—*Radial start rotating air cooled.*

American: Fredericksen.

German:
- Kruk.
- Hirch.
- R. E. P.
- B. M. & F. W.

French:
- Gnome.
- Clerget.

French—Continued.
- Canda.
- Burlat.
- Helium star.
- Demont.
- D'Henain.
- E. J. C.
- Esselle.
- S. H. K.

CLASS 4.—*Specials.*

Radial star-fixed cylinders:
- French—
  - Salmson, water cooled.
  - Laviator, two-cycle.

Opposed fixed cylinders:
- American—Ashmusen.

Squirrel-cage cylinders:
- French—Edelweiss.

Radial fan:
- French—Anzani.

Inverted automobile:
- German—Daimler.

Many engines appearing in older lists are omitted, because of the belief that they are now superseded or abandoned, and likewise, some new engines now in existence are not mentioned, because of lack of general acceptance as commercial. It may be, and is quite likely, that errors have been committed in these insertions and omissions, but this is inevitable without personal visits to the engine shops, which, in the present instance, were quite impossible.

TABLE III.—*Aero engines by classes.*

Class No.																				
I.			II.						III.			IV.								
Cylinder crank arrangement.																				
Fixed in line.			Fixed V, 2 cylinders per crank.						Rotary.			Fixed star.						Miscellaneous.		
Cooling.																				
Water.			Air.			Water.			Air.			Air.			Water.			Air.		
Engine or maker.																				
Benz.			De Dion Bouton.			Curtiss.			B. M. & F. W.			Anzani.			Two-cycle laviator.			Ashmusen.		
Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.
1,013	4	1,288	80	8	1,800	75 100 160	8 8 8	1,100 1,250 1,100	37.5	7	1,031	25 30 40	3 3 6	1,250	80	6	1,300	105	12	1,800
Daimler.			Renault.			Sturtevant.			Gyro.			Anzani.			Salmson.					
88.9	6	1,387	70	8	1,800	140	8	2,000	38.8	7	954	50 60 70	6 10 10	1,250	90 135 200	7 9 14	1,250	....	....	....
Fixed in line.			Fixed V, 2 cylinders per crank.						Rotary.			Fixed star.						Miscellaneous.		
Cooling.																				
Water.			Air.			Water.			Air.			Air.			Water.			Air.		
Engine or maker.																				
Daimler.			Wolseley.			Sunbeam.			Old Gnome.			Anzani.			Salmson.					
Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.
71.3	4	1,412	82	8	1,650	225	2	2,000	49	7	1,194	80 100 125	10 10 10	1,250	150 300	9 9	1,250 1,200	....	....	....
Daimler.						Sunbeam.			Old Gnome.			Anzani.								
99.2	4	1,373	....	....	....	150	8	2,000	62.9	7	1,156	200	20	1,250	....	....	....	....	....	....
Daimler.						Rausenberg.			Gnome.			2-cycle laviator.								
70.4	4	1,343	....	....	....	150	8	1,200	50 60 80	.... 7	.... 120	50	6	1,200	....	....	....	....	....	....

TABLE III.—*Aero engines by classes*—Continued.

Class No. I.			II.						III.			IV.								
Cylinder crank arrangement: Fixed in line.			Fixed V, 2 cylinders per crank.						Rotary.			Fixed star.						Miscellaneous.		
Cooling: Water.			Air.			Water.			Air.			Air.			Water.			Air.		
Engine or maker: Argus.									S. H. K.											
Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.	Horse-power.	Number of cylinders.	Revolutions per minute.
102.1	6	1,370							70 90	7 7										
Mulag.									S. H. K.											
101.6	6	1,396							140 180	14 14										
Schröter.																				
88.9	6	1,252																		
Daimler.						Clerget.			Gnome.			Edelweiss.								
103.1	6	1,315				200	8	1,300	100 100 160	9 14 14	1,200	75 125	6 10	1,350 1,350						
Daimler.						Laviator.			Gnome.											
60	4	1,396				80 120	8 8	1,200 1,200	200 80 100	18 7 9	1,200									
Daimler.						Panhard-Levassor.			D'Hénain.											
66.5	4	1,391				100	8	1,500	50	7										
N. A. G.						Wolseley.			Clerget.											
95.7	4	1,344				130	8	1,200	50 80	7 7	1,180 1,180									
N. A. G.									Demont.											
55.8	4	1,408							300	6	2,000									
Argus.									E. J. C.											
96.7	4	1,368							60	6	2,000									
Argus.									Esselbé.											
71.0	4	1,342							65	7	1,250									

Aeroplane Tire Development

"Now that increased attention is being given to the employment of aeroplanes as aids in national defense, it is interesting to note the part Goodyear tires play in their use," says E. R. Preston, of the Goodyear Tire & Rubber Company's aeronautic department. "Aeroplane motors, like automobile motors, must be protected from jolts by pneumatic tires. In the earlier days all sorts of makeshifts were used; even bicycle tires were pressed into service on some of the pioneer machines. Some builders went so far as to use full size automobile tires. These were equal to the occasion as far as reducing the shock of landing was concerned, but were far too heavy and offered too much wind resistance.

"Developments in the science of building better aeroplane tires have been rapid and revolutionary. As machines have improved and developed higher speeds in the air with a consequent increase in the speed of starting and landing, Goodyear tires have kept pace.

"The old type of aeroplane tire was costly and uncertain. Present day necessity has compelled tire dependability, as machines are now larger and heavier and must carry more passengers and heavier loads.

"About five years ago the Goodyear company began to develop tires to fit the peculiar requirements of the aeroplane. It was early discovered that resiliency was an important factor—that a live, springy tire actually aided the machine to get off the ground and helped to absorb the shock of landing. The Goodyear cord tire for aeroplanes has been refined to a point of efficiency equal to that of its successful big brother for electric and gasoline cars."

FOREIGN NEWS

Argentine Republic

The proposed flight over the Corderilla Andes, mentioned in a recent issue, has been accomplished. On June 24th, Captain Zuloaga and Engineer Bradley left Santiago, Chile, about 8 o'clock in the morning and arrived at Uspullata, Argentine.

The voyage occupied five hours. The aeronauts experienced contrary winds and ascended to a great height, and their balloon was occasionally forced back.

A. Santos-Dumont, now president of the Aero-Nautical Federation of the Western Hemisphere, who has arrived in Buenos Ayres, speaks highly of the achievement.

Australia

The new aviation school at Sydney, New South Wales, is nearing completion. Work will be commenced as soon as the aeroplanes now in hand are officered. An instructor and lecturer has been advertised for at a starting salary of $2,000 a year. Pilots are offered $1,400 a year. According to the regulations, students must be between the ages of 18 and 30, and must undertake to enlist in the Australian Expeditionary Forces as soon as they are qualified. The students will not be charged any fee unless they fail in their first examination after which they will be permitted to take a course at a fee stipulated by the authorities in charge. Women will be admitted. The course will include lectures and practical instructions for 12 weeks. Certificates will be given to those who successfully complete the course, while recommendations will be given to those, as mechanics, who do not succeed in getting a pilot's license.

France

The following is the official French report for June 19th:

"During the night of June 18-19 two of our air squadrons bombarded the barracks and the railroad station at Vouzieres. At the station there had been reported the movement of trains. One squadron threw down thirty-six shells of large calibre and the other one twenty-five."

An enemy air squadron dropped numerous projectiles on a village south of Verdun, where a camp of German prisoners was located. Several of these prisoners were killed or wounded.

Three American airmen, Clyde Balsey, Kiffin Rockwell, and Norman Prince, on June 18th, were engaged in a furious battle with a large number of German aeroplanes, forty according to report.

The action occurred inside the German lines, and the Americans avoided falling into German hands by a narrow margin, as they were almost forced to descend behind the German trenches. To escape a horde of Aviatiks and Fokkers, they dropped straight downward like plummets, but succeeded in landing a few hundred yards within the French side of the firing line.

The entire squadron had been ordered to follow its French Captain over the German lines, to form a barrier to protect artillery observers. Only the three Americans were with their commander when the position was reached over the German trenches.

The little group suddenly found itself in the midst of twoscore German machines flying at various heights, among which were fifteen of the latest type of Aviatiks, faster than the Americans' machines, and carrying a passenger to fire rear and flank machine guns, while the pilot handled the forward machine gun.

The American squadron circled around the enemy machines under a heavy and continuous fire. Finally, one German swerved toward the French lines, and the Americans swooped after him. The other Germans immediately went to the rescue. A mix-up followed, the Germans attacking on all sides.

The French commander saw Prince and Balsley capsize in an apparent death drop, and, believing them killed, signalled Rockwell to make for home. Prince, however, righted his machine near the ground, returning unwounded, with a perforated helmet.

Balsley owes his life to his feet being strapped into the controls, as the bullet struck his hip, exploding in the wound. Although it was his first battle, the Texan regained command of his machine and landed safely. The machine, however, was wrecked on landing. Balsley explained that his machine gun jammed after the first shot. His wound is not believed to be dangerous, unless blood poisoning sets in.

Germany

"One British biplane fell near Lens and another north of Arras after aerial battles. Two of the occupants were killed. One French machine was shot down west of the Argonne. A German air squadron attacked the railway and military factory establishments at Baccarat and Raon l'Etape."

Lieut. Immelmann, whose daring exploits as an aviator have made his name known throughout the world, is reported to have been killed in a fall with his aeroplane. The last mention of his name in an official communication was on May 17th, when he shot down his fifteenth aeroplane.

Immelmann received various decorations, ending with the highest order, Pour le Merite, when he disposed of his eleventh adversary. When he shot down his twelfth, Emperor William wrote him an autograph letter of commendation. Before the Emperor had finished the letter the report came that the lieutenant had bagged his thirteenth adversary. The Emperor crossed out the word twelfth and substituted thirteenth, saying: "One cannot write as fast as Immelmann shoots."

He was a native of Dresden, born in 1890.

The methods employed by Immelmann in vanquishing his foes have been described as simple but effective. He usually mounted to a great height, about 13,000 feet, and, when he observed a hostile aeroplane beneath him, he would swoop in one long, straight dive.

His plan was to pass in a rapid diagonal just behind his antagonist, at whom he fired continuously as soon as he came within range. If his machine gun failed to bring down his adversary he would make no effort to pursue the aeroplane, but would continue his dive until it brought him into the German lines.

Great Britain

The following is the official report for June 19th:

The chief point of interest is the aerial report of yesterday which showed a marked increase in the work of hostile aircraft. There were twenty-seven aerial combats. A hostile aeroplane was downed in our lines near Doullens and its occupants were taken prisoners. Two of our fighting aeroplanes encountered two Fokkers in the vicinity of Lens. One hostile machine was brought down considerably damaged and the other was shot down and crashed to earth from a height of 4,000 feet. In other fights in the air two German machines were brought down damaged, and one was brought to earth near Wingles. The enemy aircraft in reconnaissance crossed our lines in force and were attacked and dispersed by our aeroplanes. One of our pilots reports that two hostile machines were hit by anti-aircraft guns. Two of our machines were brought down within the enemy's lines.

On June 20th the Official Press Bureau gave out the following communication in regard to military operations in Egypt:

"A large enemy aerodrome near El Arish (on the Mediterranean, 100 miles east of the Suez Canal), enemy camps and troops were bombed by eleven British aeroplanes on Sunday. A hostile pilot was about to ascend and his aeroplane was destroyed by a down swooping raider. Seventy-six bombs were dropped. Five and probably more enemy aeroplanes were destroyed.

"Three British aeroplanes were lost. Two pilots were saved. The third, not escaping, burned his machine."

The official statement issued by the War Office on June 23rd is as follows:

"In the fine weather yesterday there was considerable activity in the air along our front. There were twenty-two combats, mostly indecisive, but two of our machines were brought down. Our artillery obtained direct hits on two hostile aircraft batteries, and the ammunition of one of these batteries continued to explode for twenty minutes.

Flying from the trenches in France to London and back again in the same day is becoming a not uncommon experience for officers of the British Army. Recently an officer left the trenches early one morning, crossed the English Channel in an aeroplane, and was in a London Turkish bath in a few minutes under four hours from the time he left the battlefield.

Later another soldier did the trip in even shorter time, leaving the trenches in the early morning, Turkish bathing three and a half hours later in London, lunching at one of the leading hotels, and arriving back "somewhere in France" the same evening.

The four-motored Sikorsky type biplane, a large quantity of which are being constructed in England.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
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SPRINGFIELD MODEL AERO CLUB
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CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Motors for Model Aeroplanes

(*Continued from page* 452)

"Now, if we desire to build a spring motor which shall be economical of power, we are driven to pursue the same road as that which has been followed in the case of the evolution of the rubber motor. In other words, we must dispense with all gearing or reduce it to the absolute minimum, and use a very long spiral steel spring some 3 ft. in length, made of fine steel piano wire of many coils. Some three years ago I constructed several such motors, the coils having running through them a central rod; the whole idea being taken from the form of spring used in certain kinds of spring blinds. With the efficient surfaces and propellers now in use, durations of half a minute could undoubtedly be obtained with them. The longest duration which I personally obtained was about 19 secs.

"But even under the most favorable circumstances, such cannot compare with rubber as a motive power; from 5 to 6 times the amount of energy can be stored in a well-lubricated rubber motor compared with a spring motor *of the same weight.* Now the objection, *i.e.*, the scientific objection, which can be brought forward against the rubber motor is the spreading out or extension of the weight longitudinally, which gives rise to a large moment of inertia about the lateral axis of the machine, whereas it is one of the chief aims of good aeroplane design to keep the moments of inertia about all the three principal axes of the machine as small as possible. But as we have already shown exactly the same objection can be urged against the steel spring motor when used in a form that is of any practical use."

(*To be continued*)

Pacific Northwest Model Aero Club

Although those members of the Club who flew their model aeroplanes at Harbor Island, Wash., probably failed to establish a record that might win them the $100 prize offered by the Aero Club of America, they learned something of the difficulties of managing a flying machine in a stiff wind.

A breeze from the northwest blew steadily. The machines, every one of them about three feet long and driven by twin propellers, soared upward in a long slant as their owners released them; then, as the breeze continued to drive them onward, they turned, nearly capsized, and, as they righted themselves, tried to climb against the wind. The whirring propeller blades beat vainly against the breeze. As the rubber-band motor began to die, the flimsy device of oiled paper and light wood suddenly shot downward to earth.

It was easy to imagine that the spectator was viewing from a distance a real monoplane, controlled by human hand, and that the accident just witnessed had resulted fatally.

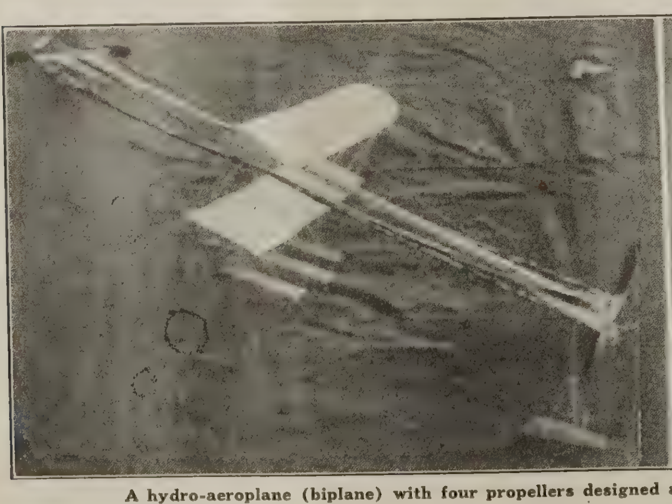
Because of the unfavorable weather conditions only a few members of the Pacific Northwest Model Aeroplane Club entered the contest. Members whose machines made flights were George Stoneham, Rene Valadon, Clyde Atteberry and Clarance Minto. The contest was under the direction of Robert La Tour, manager of the club. Prof. Charles A. Guerard, of the University of Washington faculty, acted as timekeeper. While most of the machines traveled nearly one-eighth of a mile, few of them remained in the air longer than three minutes.

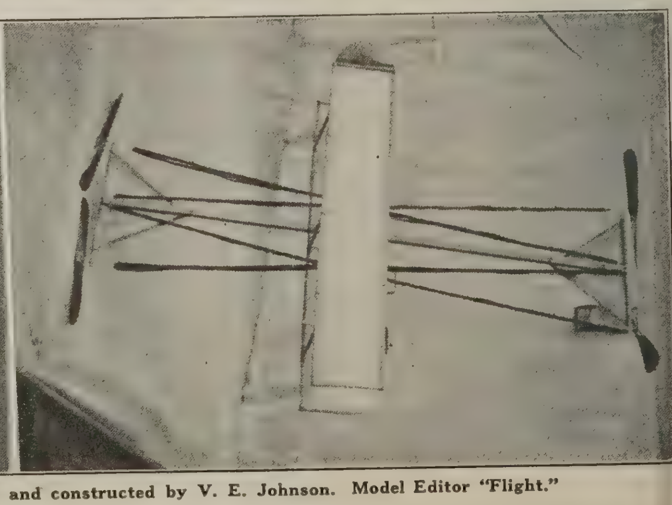
A Model with Four Propellers

We give this week two illustrations of a model hydro-aeroplane fitted with four screws, two tractors and two pushers. As the photographs show, the model is a biplane with four floats, one under the triangular elevator, the other three being situated partly under and partly in front of the main planes. The triangular elevator, is set at a positive angle (adjustable); the corresponding triangular-shaped tail is fixed, and has a slight negative angle (to assist longitudinal stability). The main planes are shown in the illustrations in such a position that the centre of gravity is slightly in advance of their leading edge. The four stands of rubber cross one another, as clearly shown in the photograph, and are found not to interfere with one another; they could easily be separated by wire rings if necessary.

The length of the model is 3 ft., the span 2 ft., area of main planes 216 sq. ins., total weight 8¾ ozs. The 4 motors are each composed of 6 strands of 3/16-in. strip rubber. The total weight of the 4 floats is 1 oz. The model was constructed as a test against a 6-oz. 2-propeller model, the planes being the same in both cases, and the floats the same in the two cases, save that an additional one was added in the centre to support the extra 2¾ ozs.

In the case of the biplane with two propellers, two motors each of 8 strands 3/16-in. strip rubber were used.





A hydro-aeroplane (biplane) with four propellers designed and constructed by V. E. Johnson. Model Editor "Flight."

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Moment of Horror

By Thomas L. Masson

"We are lost!"

There was a sudden loud snap, as one of the rear wings of the huge aeroplane broke and the machine swerved sharply down toward the earth, only a few hundred feet away. In the near distance the great metropolis stretched out like a spreading, discordant giant.

The companion of the brave young aeronaut, who was steering, turned deathly pale as he shouted out the words. "Nothing can save us!" he muttered hoarsely.

As for the brave young aeronaut himself, he smiled.

"Have no fear," he whispered. "The rudder still works, and, although we've got to go down, I think I can still save our lives." At the same time he pointed toward a large object beneath them, toward which they were descending with the swiftness of an avalanche. Below them the crowd surged and shouted. Then there was a breathless silence.

"What did I tell you?" said the brave young aeronaut a moment later, as he emerged from the débris with a triumphant smile. "I knew that if the steering gear held out we would be all right."

For, with rare presence of mind, he had landed his machine on top of a woman's hat that was sailing up Fifth Avenue.

"Who biffed you on the nose, Bill?"

"Don't know—did it when I wasn't looking."

Amid the Clouds

He—Let me be the light of your life!

She—I don't want a light that goes out every night.

Lots of Will

"I'm going to quit smoking."

"You haven't the power."

"The devil I haven't. Why, I've quit four times already this month."

Friend—Are you taking good care of your cold?

Sufferer—You bet I am! I've had it six weeks and it's as good as new.

That's What They All Say

Mr. Batch—Do you ever get homesick?

Aviator Batch—Only when I'm home.

In the Hangar

First—"Couldn't sleep last night."

Second—"Too much noise?"

First—"Yes. I heard the bed ticking."

Adaptation

Knicker—"Is Smith busy?"

Bocker—"Yes; putting wings on his auto jokes."

Merely

Groundkeeper—Does your barber shut up Sunday?

Ticket Agent—No, he merely closes his shop.

An Attachment

Agent (entering office of motor manufacturer)—I've an attachment for your typewriter, sir, which I——

Busy Man—Well, settle it with her. Your love affairs are no concern of mine.

At the Aero Show

Michael—Whist, Pat—quick, take this skeleton key!

Pat—And pwhat the divil do I want with it—sure I ain't got any skeletons to unlock.

At the Aviation Camp

"That guy would certainly make a good soldier."

"Howssat?"

"Oh, you can treat him, but he won't retreat."

When the Machine Landed

Pilot: "Hereafter, I want nothing to do with you. Do you understand?"

Mechanic: "I doose. After this when we come together we stay apart."

When Up in the Air

By F. P. Pitzer

We have frequently been asked to suggest some form of dress for women airshippers, some sort of aerial costume for lady aeronauts, and it is only after continual persuasion that we offer the following advice regarding raiment for female balloonists:

1. Dress very plainly—aeroplanely, in fact.
2. Your hat must contain a flower—self-raising flour is most appropriate, as it will help the machine to rise.
3. If you wear any flowers at your breast, they must be made of paper—fly-paper.
4. You should wear a dress with old-fashioned balloon sleeves.
5. Do not wear long hatpins, as they tend to attract lightning, and when you are up in an airship lightning doesn't strike twice in the same place—it doesn't have to, as there isn't anything left to strike the second time. We would suggest fastening your hat to your hair with clothes-pins.

"A FLYER IN HATS."
(From Paris.)

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$28,975,000 Needed for Aerial Defense

A COMMITTEE of the Aero Club of America, headed by Alan R. Hawley, president, and Henry Woodhouse, governor, visited Washington June 29 on behalf of aerial preparedness.

The committee and Representative George Murray Hulbert of New York held conferences with Administration officials at the White House, the War and Navy Departments and with Secretary Tumulty, Senator George E. Chamberlain, chairman of the Senate Committee on Military Affairs; Secretary of War Baker, Brig. Gen. George P. Scriven, Chief Signal Officer, and Col. George O. Squier, in charge of army aeronautics. They also met Secretary Daniels.

At the request of Secretary Baker, the committee submitted to the War Department the following plan for aerial preparedness, totaling $29,975,000:

"Every consideration of the country's safety demands that steps be taken immediately to organize an aerial service as follows:

"First—Twelve militia divisions have been called out. They have no aeronautic equipment outside of the few aeroplanes supplied by public subscriptions. It is provided in the organization tables of 1914 that each militia division should have an aero squadron. Each squadron cost for organization, equipment and maintenance for one year $800,000, making a total of $9,600,000.

"Second—For the four regular divisions of the army are required four aero squadrons as provided for by the organization tables. The cost of organization, equipment and maintenance of each squadron for one year is $800,000, making a total of $3,200,000.

"Third—For the three coast artillery districts there should be six aero squadrons. In Europe there are allowed three aeroplanes for each battery, so as to always have one ready for air service. We have seventy-three forts, with an average of three batteries to each fort, or 324 batteries in all. To allow only six aero squadrons for artillery service is to allow the very minimum. The cost of organization, equipment and maintenance of an aero squadron for one year is $800,000. The total is $4,800,000.

"Fourth—As 300 aviators are needed immediately and past experience and European practice have shown that only one-third of the men trained for aviation usually qualify for military service, to get the 300 aviators needed it will, therefore, be necessary to train 900 men. To train these men it is necessary to allow one aeroplane in operation and one in reserve for every four men, making a total of 450 aeroplanes needed to train 900 men and keep them in training until they have been included in the aero corps. Training aeroplanes cost an average of $7,500 each, making a total for training machines of $3,000,375.

"Fifth—To train and keep in training between 300 and 600 men will require ten aviation schools, or one school for every thirty students, the time required to train each in military aeronautics being between three and six months. To establish these schools, which are to be partly schools for training and partly schools for graduating, will cost about $500,000 for each school, or a total of $5,000,000.

"Sixth—Whereas dirigibles and kite or observation balloons are badly needed and are invaluable for certain purposes, it is necessary to take steps to provide them. It is recommended that $2,000,000 be allowed for this purpose to remain available until spent.

"Seventh—For a motor competition, testing of automatic stabilizers and other devices and aeroplanes promising to develop inherent or automatic stability in aeroplanes, for a 'safety competition' and other similar development intended to increase the safety, ease of operation and usefulness of aeroplanes, it is recommended that the sum of $1,000,000 be made available.

"In this report Mr. Hawley stated that the above totals $28,975,000. This plan is submitted with the most sincere hope that it will be given prompt consideration. The members of the executive committee of the Aero Club of America arrived at these figures after thorough consideration of the aeronautical needs of this country and the plans other countries have made for permanent adoption. In other words, this plan provides only for the aeronautical equipment necessary for the country to defend itself if attacked by any one of the first or second class Powers.

"The committee believes that every consideration of the safety of this country demands that steps be promptly taken to carry this plan into effect."

Senate Committee Asks for $13,000,000 for Army and Militia Aeronautics—Aero Club Asked for $29,000,000

THE Senate Military Committee on July 1st reported the Army Appropriation Bill, which included $13,081,666 for army and militia aeronautics as follows:

AVIATION SECTION

Maintenance of one and a third aero squadrons...	$1,066,666
Maintenance San Diego Aviation School..........	653,000
Equipment and maintenance of one and a third aero squadrons	1,071,200
Construction of hangars, shops, barracks and quarters, water, lighting, sewage, etc., San Diego School	300,000
Construction of hangars, etc., as above at the aviation training and testing station in the Eastern United States	380,000
Lighter-than-air equipment, man-lifting kites, etc.	250,000
For organization, equipment and maintenance of twelve aero squadrons for the twelve militia divisions ordered into service, either in the militia or from the regular army reserve, and the officers' reserve corps..........................	9,640,800
Total	$13,081,666

It will be noted that this bill provides for equipping only one and one-third air squadrons for the Army, which means only an addition of 16 more aviators. This is due to the fact that Congressman Hay, in making up the Army Reorganization Bill, included a "joker" which limits the carrying out of the provisions of the bill to one-fifth each year for five years. This bill authorizes the President to make effective all or part of the bill as desired.

America Must be Given a Navy Equal to the Best. If the first line of defense of all first-class powers have between one thousand and two thousand aeroplanes available, it is evident that the present naval program which provides only seventy-five aeroplanes for our first line of defense does not aim to make our Navy equal to the best, but makes the Navy tenth among the world's navies.

1000 Enroll in Aero Club List as Prospective Army Aviators

THAT the Army Air Service is to be a popular service is shown by the fact that applications from men who would like to join the Army Air Service are still flooding the Aero Club of America. These applications now number over 1,000, and include bankers, brokers, doctors, automobile dealers, a professor of agriculture, many artists and newspaper men and several hundred gasoline engine experts. Thirty-two licensed aviators and as many students of aeronautics have volunteered their services so far, besides the sixty officers of the National Guard of different states whose expenses while training in aviation have been paid by the National Aeroplane Fund.

This flood of applications began coming to the Aero Club of America soon after the Carrizal incident, when the Aero Club took steps to mobilize the aeronautical resources to meet the emergency. These applicants are so anxious to join the Air Service that after volunteering their services and having been advised that their applications have been transmitted by the club to the War Department, they inquire, many of them daily, by telegraph, local and long-distance telephone, special delivery letters and regular mail.

The War Department has received their applications and now is only waiting for President Wilson to authorize the organization of the five increments of the United States Army Signal Corps, the Officers' Reserve Corps and the Enlisted Men's Reserve Corps.

The Army Reorganization Bill—better known as the Chamberlain-Hay bill—provides for increase of every branch of the Army in five increments which are to be organized one each year, but the President can organize the five increments of any one branch of the service. One increment, which is all that the Signal Corps can organize without President Wilson's authorization, would only add ten aviators to the Army. The entire five increments would only give 140 aviators. As the Army needs at least 200 aviators, and to get these it must train three times that number of men—as only one-third usually prove to be adapted to military aviation service, it is necessary for President Wilson to authorize the organization of the five increments of the Signal Corps this year, as provided in Section 24 of the Army Reorganization Bill and to also authorize the organization of the Officers' Reserve Corps, as provided for in Section 37 of the bill. To get the mechanics it is necessary for the President to authorize the organization of the Enlisted Men's Reserve Corps, as provided for in Section 55 of the bill. The Aero Club of America sent a committee to bring before President Wilson the need of authorizing these provisions, and were assured by Secretary Tumulty that the matter would be brought to the attention of President Wilson upon his return from Philadelphia. Therefore, action may be taken on this matter in a few days, and the volunteers for the Air Service may then be considered by the Army, which is ready to put them through the necessary examinations. Some of the National Guard officers of different states who have completed their aviation course of training have already been mustered into the Army.

Aeroplane Strong Arm of Future Armies

(Editorial in Beloit, Wis., News)

ON April 24, according to dispatches, eight aeroplanes belonging to the British air fleet destroyed a Turkish camp at Quatia, Egypt.

"The enemy suffered severe casualties from bombs dropped, and from machine-gun fire," runs the dispatch.

There is no reason for doubting the truth of the story because of the fact that the engagement was of no great strategic importance.

This is only one of many reports which have been filtering in from the war showing how wonderfully the aeroplane is developing as a fighting machine. As a scouting device it has almost supplanted all others. It did this from the beginning of the war. As a means of attacking camps, supply stations, and even bodies of troops, it must be reckoned as a powerful factor in future wars.

Egypt is an open country, and encampment may be peculiarly vulnerable to attack from the air; but the sea is open, too, and the warship is as approachable as any camp can possibly be.

The troops on the battle fronts in Europe are dug in and sheltered in trenches. Explosives dropped from the air may not be as effective as those fired from cannon; but the airship can penetrate the lines at will unless stopped by other airships, while the troops in the rear of the fighting line are out of range of the hostile guns.

Eight aeroplanes destroyed this Turkish camp. Suppose they had numbered 80, or 800, or 8,000 or 80,000? Would they not have been able to destroy and kill in proportion to the increased numbers?

No reason appears why they should not.

Suppose that Germany or the allies should suddenly take the air with 100,000 aeroplanes?

Would they not be able to disorganize the lines of their antagonist so far to the rear of the zone of gunfire as to make it possible for the infantry attacks to pass through and beyond any line which they can now occupy?

The airship must become an arm without which in immense force no army can win in the future.

We had just eight when the Mexican expedition began, and of these, six are now reported as reduced to the condition of junk!

Is the army efficient?

Navy Is Lacking in Aviation Equipment

(Editorial in Chicago Examiner)

PEOPLE who are inclined to doubt the tales of the lack of preparation for modern war in the United States navy should give heed to certain facts set forth by the Aero Club of America concerning preparation for aviation efficiency.

First, the Navy Department is not prepared to train aviators at the naval aeronautic station in Florida. Anyone going there must already have training. For the department's circular of instructions says: "No officer or enlisted man will be sent to Pensacola for training unless he possesses a sufficient preliminary education that will enable him to obtain the full benefits of the training."

Only four aeroplanes and nine aviators could be assembled for the naval manœuvres at Guantanamo, and these officers had to do ship duty and had but little time for aviation.

The aeroplanes were not equipped with wireless apparatus, so they could not be used to spot gun practice, and could not aid in directing movements of a fleet or squadron against "enemy" ships.

No provision has been made for training naval militia aviators or for training schools.

So the navy is worse off in aeronautics than the army, and the Mexican campaign has shown how utterly unprepared our army was in the matter of aeroplanes and aviators. This is at a time when the European air is full of crafts, battling, observing, reporting—the eyes and ears and tongues of the armies and the navies of the belligerents.

"It seems impossible that national safety, public demand, expert advice and the lessons of the great war can be so totally disregarded," commented Henry A. Wise Wood, chairman of the conference committee on national preparedness, who resigned from the naval consulting board as a protest against Secretary Daniels' suppression of the original report of the general board of the navy. "The American public will have an opportunity to protest at the polls in a few months. Until then naval aeronautics will have to be supported by public subscriptions and volunteer efforts."

Aerial Preparedness

(Editorial in N. Y. Evening Mail.)

THE Aero Club of America is out for real preparedness. The executive committee of that organization, after a thorough study of the need of aerial equipment as an important part of the general project of national defense, urges the immediate expenditure of no less than $20,400,000 on that branch of America's armament.

Pointing to the lessons of the recent naval battle of the North Sea, the committee asks Congress to vote an appropriation of $3,000,000 for naval dirigibles, kite balloons and stations, "whose immense value has been shown" in that engagement.

Instead of the trifling $1,222,000 expenditure provided in the pending Army bill for the Army aerial service, the committee urges the adoption of a comprehensive scheme of construction and organization, at a cost of $5,000,000. The organization of the Army aviation service, in the judgment of the committee, should include five complete squadrons with trained officers and civilian expert mechanics.

The committee also recommends the expenditure of $2,000,000 for the organization and equipment of at least twenty companies of flyers in the National Guard, and the construction of a chain of coast patrol aerial stations at a cost of $1,000,000.

The Aero Club of America, in calling attention afresh to the neglect of a most important branch of defensive preparedness—a branch which has amply proved its value in this war—is doing a service to the nation.

The News of the Week

Transcontinental Aeroplane Race Postponed

Preparations for the Transcontinental Aeroplane Race, scheduled to start from New York on September 2nd, have been discontinued in order that the undivided attention of aviators and constructors may be centered upon the nation's immediate needs.

This course was decided upon at a conference at the Aero Club of America between Major C. F. Hartman and Lieut. Carberry, representing the War Department, the Executive Committee of the Aero Club, leading manufacturers of aeroplanes and a representative of Ralph Pulitzer, donor of the trophy which initiated the race.

The Pulitzer trophy, offered for an Annual Aerial Derby under the auspices of the Aero Club, remains at the disposal of that organization, and the race is called off only for so long as the international possibilities may require.

It was agreed that the Government needs every available skilled pilot, either on the Mexican border or in training camps teaching others to fly. Two hundred aviators are needed to meet the importunate possibilities of the Mexican situation, and the regular Army can muster only fifteen. Five hundred men should be placed immediately in training in order that from that number two hundred proficient flyers may be obtained quickly. At best it will be fifty to ninety days before the first men, starting training now, can be ready for active service.

Thanks to the foresight of the Aero Club of America, forty national guardsmen, trained at the expense of the National Aeroplane Fund, are nearly ready for service, and many of them, with a few more weeks of training, will be available as instructors. About thirty civilian pilots also can be ready as instructors in a short time.

Aviation volunteers are not lacking, neither are machines. The constructors at yesterday's conference indicated their readiness to deliver machines at the rate of ten a day, notwithstanding the large orders being filled for Europe. The problem is training men to fly, and to further this end it was decided unanimously that the only patriotic course was to postpone the transcontinental race.

Second Battalion N. M. N. Y. Seaplane Christened

Mrs. Vincent Astor christened the new Burgess-Dunne hydro-aeroplane of the Second Battalion, Naval Militia of New York, in the presence of about 350 invited guests at the foot of Fifty-second street, Brooklyn, on July 1. A flag decorated stand was erected outside the Second Battalion Armory, and the official guests gathered there for the ceremonies.

In a few words, Charles L. Lawrance, of the citizens' committee which bought the seaplane, offered it to the State of New York. Commodore Forshew, head of the Naval Militia, accepted it in the name of the State, and in a short speech turned the machine over to Captain Edward T. Fitzgerald, in command of the Second Battalion. Governor Whitman sent a telegram expressing regret at his inability to be present.

When Mrs. Astor had broken a bottle of champagne on the shell the official guests were taken to the United States ship "Gloucester," formerly J. Pierpont Morgan's yacht "Corsair," which is now used as a training ship for the Second Battalion, to watch the first official flight. Alongside the "Gloucester," which lay fully dressed in midstream, was Vincent Astor's yacht "Noma."

While the guests were being transferred to the yachts by launches a giant crane lifted the new air machine into the water. Vincent Astor, in the uniform of an ensign, supervised the towing, and when out in midstream Ensign Samuel Pierce started it under its own power.

The plane rose gradually and traveled about six miles at a rate of thirty-five miles an hour. Ensign Samuel S. Pierce had sent it skimming over the water and then taken it 800 feet in the air, while passing boats whistled a salute.

A citizens' committee of the Aero Club of America collected subscriptions for the machine ranging from $10 to $100. It is to be used for scout work, and Aymer Johnson, chairman of the committee, said that anyone would be allowed to visit the armory and learn how to manipulate it.

Members of the committee, who also contributed to the purchase of the machine, were Henry von L. Meyer, James Gordon Bennett, Vincent Astor, Charles L. Lawrance, Bradish Johnson, V. S. Byron, A. M. White, George F. Baker, Edmund L. Baylies, William Berri and George Blagden.

Christofferson Co. Gets Chinese Order

The San Francisco *Examiner* reports that the Christofferson Aircraft Co., with factory at Redwood City, Cal., have secured an order from the Chinese government for 25 aeroplanes.

The contract was made with J. Lin, representing the Chinese, who says that the planes are to be used in transporting mail over routes not yet definitely named, but tentatively laid out.

Silas Christofferson has just concluded a successful test of his new biplane built to comply with the strict specifications made by the United States Government.

In a trial flight the aeroplane, carrying an observer, and with Christofferson as pilot, quickly rose to a height of 2,000 feet, and in a four-mile circle attained a speed of 115 miles an hour. The contract called for a speed of 95 miles. The aeroplane is equipped with a 125 horsepower Hall-Scott engine. The exhibition flight was witnessed by representatives of several foreign governments.

The aeroplane school which Christofferson has established has created much interest at Redwood, and this will be enhanced, it is expected, when the factory is completed.

The twin-motored Curtiss hydroaeroplane, exhibited recently on the Senate Lawn, Washington, D. C.

Assistant Secretary of War Ingraham, and the Curtiss hydroaeroplane, on the Senate Lawn.

Navy to Get New French Hydroaeroplane

According to a press dispatch from Paris a hydroaeroplane built for the United States Navy is being tested every evening on the Seine, near Juvisy. The contract for its purchase was made in 1914.

The biplane was built by Paul Schmidt on the principle of the variable angle of incidence, by which it is possible to vary the angle at which the four wings hit the air, thus enabling the machine to begin flying even in rough water.

The motor is a Saltson 150 horsepower tractor type. The floats are specially designed by M. Tellier, an expert. The speed the machine can make in the air is sixty miles an hour. A professional pilot of the Schmidt company is flying the machine with Lieut. Bernard L. Smith, American naval attache here, as a passenger.

Schmidt is financed by August Belmont, whose Paris representative is his nephew, Louis Nelson. The American Navy Department paid $25,000 for the machine, which will be shipped to the United States in the middle of July if the trials are successful. Lieut. Smith will accompany it.

Yale Oarsmen Form an Aviation Corps

With four Yale varsity oarsmen as a nucleus, an aviation corps is being organized by Payne Whitney, '98, himself a former crew captain. They will offer their services to the nation in case of war.

The four are: Capt. Seth Low, 2d, of New York, son of the late A. L. Low, captain of this year's crew and for three years a member; Albert R. Sturtevant, of Washington, D. C., captain of last year's crew, and No. 5 in the boat last week; Cord Meyer, of Great Neck, L. I., just elected captain of next year's crew, and Charles Deeriwiman, of Moline, Ill., Yale, 1915, No. 7 of that famous crew and one of the coaches this spring.

Cord Meyer is a licensed aviator already. The others are studying at Mineola, going over from Payne Whitney's summer home on Long Island at about 4 o'clock each morning for instruction. The aviation corps has no connection with the Yale Aviation Corps organized here last winter.

Andermat to Enlarge

The plant of the Andermat Aeroplane Co. at Sunnyvale, California, is to be bought and enlarged for a working force of 400 mechanics, according to a report in the San Francisco *Bulletin*. The Andermat machines are large double-motored military tractors, with a wing spread of about 120 feet.

A Correction

In our issue of June 12, in our caption below the illustration of the Richardson tandem hydroaeroplane, we inadvertently stated that it was motored with Roberts motors. The fact is that it was motored with Harriman motors, now known as G. A. C. aeronautical motors—the Harriman patents having been acquired by the General Aeronautic Co. of New York City.

Fourteen Aeroplanes for the Army

The fourteen aeroplanes which we stated in our last issue had been ordered by the War Department, have been placed. The orders include six Curtiss twin-motored 'planes (two 90-horsepower motors); eight extra motors and spare parts; two Martin machines with Hall-Scott 130-horsepower motors; two extra motors and spare parts; two Sturtevant machines with 135-horsepower Sturtevant motors; two extra motors and spare parts; two Lowe-Willard-Fowler machines with 135-horsepower Thomas motors, one extra motor and spare parts, and two Thomas machines with 135-horsepower Thomas motors, two extra motors and spare parts.

These fourteen machines will cost $275,000.

Cincinnati Speedway to be Aerodrome

Negotiations have been opened by the Cincinnati Speedway Company with the manager of Art Smith, the American aviator, for a series of exhibition flights at the new Speedway at Sharonville when Smith returns to this country from Japan. In grading for the race track the management of the Speedway also is giving much attention to the aviation field, which will be located in the center of the two-mile track, and will be equipped with every device necessary for carrying on aviation meets. The dedication of the new track is set for Labor Day, September 4, when a 300-mile race, in which the leading auto drivers of the country will participate, will be staged. If the aviation field is completed by that time, there is a possibility of several flights being arranged for preceding the auto race. The management of the Speedway also contemplates placing its aviation field at the disposal of the state.

The L. W. F. tractor biplane.

Aerial Bombs for the Army

Gas bombs, incendiary bombs, aerial bombs and hand grenades are being made and experimented on at the Frankford Arsenal, Philadelphia, for use of the United States Army. This announcement was made by Colonel George Montgomery.

Experiments are now being conducted with a new gas bomb. This bomb will contain a combination of sulphur dioxide, a deadly gas, and several other poisonous gases.

An aerial bomb, which tests show to be satisfactory in a high degree, is on a new principle. Instead of being dependent on atmospheric pressure, the fuse depends solely on a clock-like arrangement.

"This is considered advantageous," Colonel Montgomery said, "because when the bomb has been timed for such a height the rarified atmosphere at high altitudes causes a too rapid burning of the fuse. But with the clock-work arrangement the bomb will explode exactly where desired."

Senate Votes to Buy the Hammond Patent

The Senate adopted on June 30 the House provision in the fortification appropriation bill authorizing the acquisition of the system of radio control of torpedoes and vessels invented by John Hays Hammond, Jr. The House bill authorized the expenditure of $750,000 to acquire the patent and property rights in the system after an investigation by an expert board proves the efficacy of it.

A limit of $30,000 is fixed as the amount that may be expended for the Government tests and if these prove successful the President shall decide upon the report of the board whether the system shall be acquired.

Service at Trinity for Victor Chapman

Friends of Victor Emanuel Chapman wept before the entwined flags of France and the United States, which stood at the chancel rail of Trinity Church Friday, June 30. These flags were all there was to tell the story of the young American who lost his life in the battle in the air above Verdun on June 23. The simple service of the Episcopal Church was used, at which the Rev. William B. Kinkaid, senior curate of Trinity, officiated, assisted by the Rev. S. Drury, of St. Paul's School, Concord, N. H., and the Rev. Prescott Evarts, of Harvard, where Victor Chapman was a student.

Mr. and Mrs. Frederick Prince, of Boston, parents of Sergeant Norman Prince, who was the companion of Sergeant Chapman in the battle in which he lost his life, sat with the young hero's parents. There were also several members of the New York National Guard in uniform.

Chicago to Furnish Army Aero Company

Mr. Albert Bond Lambert has arrived in Chicago to inspect the local flying field, which he has recommended to the Government as a suitable place to establish a mobilization camp for military aeronautics. He will assist in forming at Chicago a center for military aeronautics. An aeroplane squadron will be formed, to be known as Company A, United States Central Aviation Reserve. Jack Vilas, the well-known aviator, will be the company commander.

Meanwhile Chicago and the central west have undertaken to establish one aeronautic squadron, consisting of three companies. Each company must include at war strength 44 men, aeroplanes, and automobile convoys. Of these 44 men at least four must be flyers. Mechanics of high grade are also necessary.

The flyers will rate as lieutenants when mustered into the Federal service and will draw that pay while training.

Jack Vilas has undertaken to form a company of North Shore young men that will be a worthy rival of Battery C. A second company already is in the making, and will deliver its military biplane, a German Taube type, to the aviation field this afternoon.

Burgess News

The Burgess Company, at Marblehead, is hard at work on a rush order for propellers for the War Department. It will be recalled that one of the difficulties encountered by the Army Aviation Service on the border has been the lack of suitable airscrews, with the result that the new machines recently sent to the Mexican front have been virtually useless. Under the lately developed critical conditions, the inability to make use of the dozen machines which are ready for service, with the exception of the propellers, has been a tremendous handicap to the United States military forces, and has once more disclosed the weakness of the aviation arm and the imperative need of strengthening it.

With the new propellers furnished by the Burgess Company, the work of airscouting and communication, which has been virtually at a standstill for several weeks, can be once more resumed. The propellers have been especially designed for the high-powered motor in use in the new army machines, and have been constructed up to the high standard of the company.

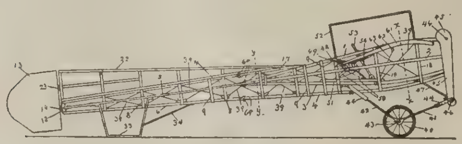
Aviator Clifford I. Webster has gone to Pensacola for tests of the Burgess seaplanes recently shipped to the Navy Aeronautic Station there. This craft is of the same type as that which made such an excellent showing in its trials at the Florida nautical headquarters last January, attaining an airspeed of approximately 80 miles an hour.

The inside breaking in test stands at the Hall-Scott Motor Co. factory at San Francisco. The engines are put on these stands and run under their own power for from 12 to 20 hours.

RECENT AERO PATENTS

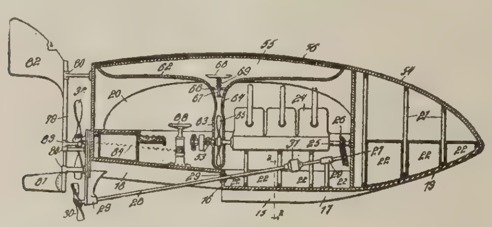
BY WILLIAM N. MOORE

1,177,545. AEROPLANE. Glen B. Smith, Fort Worth, Tex. Filed Jan. 21, 1915. Serial No. 3,424. (Cl. 244—30.)



1. An aeroplane having a fuselage composed of a plurality of side longitudinal bars for the front part thereof, terminating at the central part of the aeroplane with relatively long feather ends and a pair of side longitudinal bars for the rear part of the aeroplane terminating at the central part of the machine with relatively long feather ends and connected to said first mentioned feather ends, and top and bottom longitudinal bars attached to the front and rear parts of the aeroplane and terminating with relatively long feather ends at the central part of the aeroplane, and means for attaching the feather ends of the said front bars to the feather ends of the said rear bars.

1,177,276. HYDROPLANE-MACHINE. Carleton Ruhe, Olean, N. Y. Filed Aug. 10, 1915. Serial No. 44,744. (Cl. 114—66.5.)



1. In a hydroplane of the character described, a hull, propelling means therefor, a stabilizing plane connected with the hull and adapted to contact with the water, and means for forcing air between the stabilizing plane and the surface of the water.

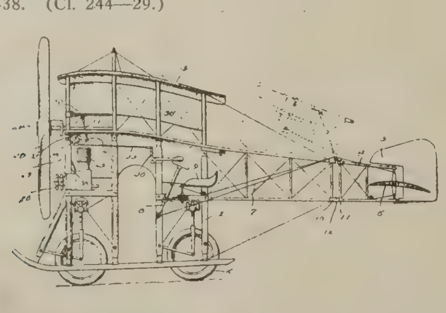
2. In a hydroplane of the character described, a hull, propelling means therefor, a stabilizing plane connected with the hull and provided upon its lower contacting surface with air outlet means, and means to supply air to the air outlet means.

3. In a hydroplane of the character described, a hull, propelling means therefor, stabilizing planes arranged upon opposite sides of the hull and connected therewith and having their lower contacting surfaces provided with apertures, and means to force air outwardly and downwardly through the apertures.

4. In a hydroplane of the character described, a hull, propelling means therefor, hollow stabilizing planes arranged upon opposite sides of the hull and connected therewith and having their lower contacting surfaces provided with apertures, and means to supply air under pressure into the propeller stabilizing planes.

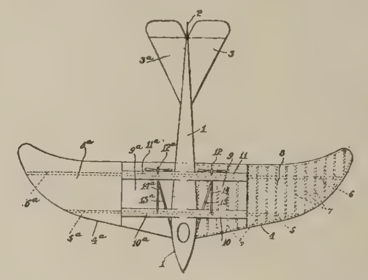
5. In a hydroplane of the character described, a hull, a vacuum chamber disposed upon the upper portion of the hull and having its upper side apertured, propelling means for the hull, and means for creating a vacuum within the vacuum chamber.

1,166,061. AEROPLANE. George Lehberger, Brooklyn, N. Y. Filed Nov. 27, 1914. Serial No. 874,329. Renewed Nov. 19, 1915. Serial No. 62,438. (Cl. 244—29.)



1. An aeroplane comprising a main frame, a plane fixed upon the main frame, planes pivotally connected with the main frame and located at the side edges of the fixed plane and adapted to be moved on their pivots from positions approximately vertical at the side edges of the main frame to positions approximately horizontal with relation to the same and also movable bodily toward and away from the main frame.

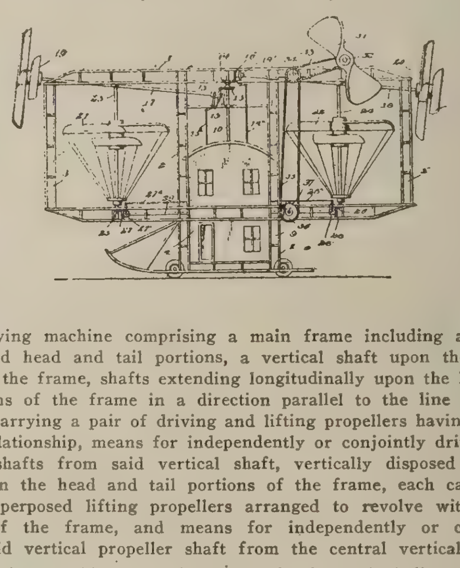
1,165,770. AEROHYDROPLANE. Edson F. Gallaudet, Norwich, Conn. Filed Feb. 17, 1914. Serial No. 819,148. (Cl. 244—2.)



1. In a machine of the character described, the combination, with a body of stream line form, on a pair of relatively narrow laterally extended dihedral wings adapted both to float and laterally balance the machine upon water and to provide a planing surface therefor.

2. In a machine of the character described the combination, with a body of stream line form, of a pair of dihedral wings which provide a flattened V-shaped planing surface beneath and substantially coincident with the bottom of the body and are adapted both to support the machine in the air and to support and float it upon the water.

1,183,799. FLYING-MACHINE. Vincent J. Conces, Sr., East Chicago, Ind. Filed Oct. 13, 1915. Serial No. 55,700. (Cl. 244—19.)



1. A flying machine comprising a main frame including a central portion and head and tail portions, a vertical shaft upon the central portion of the frame, shafts extending longitudinally upon the head and tail portions of the frame in a direction parallel to the line of flight, and each carrying a pair of driving and lifting propellers having a fixed angular relationship, means for independently or conjointly driving said propeller shafts from said vertical shaft, vertically disposed propeler shafts upon the head and tail portions of the frame, each carrying a pair of superposed lifting propellers arranged to revolve within such portions of the frame, and means for independently or conjointly driving said vertical propeller shaft from the central vertical shaft.

2. A flying machine comprising a main frame including a central portion and head and tail portions, a vertical shaft upon the central portion of the frame, shafts extending longitudinally upon the head and tail portions of the frame in a direction parallel to the line of flight, and each carrying a pair of driving and lifting propellers having a fixed angular relationship, vertically disposed propeller shafts upon the head and tall portions of the frame, each carrying a pair of superposed lifting propellers arranged to revolve within such portions of the frame, connections for driving the respective propeller shafts from the central vertical shaft, and means for controlling the respective connections.

3. A flying machine comprising a main frame including a central portion and head and tail portions, a vertical shaft upon the central portion of the frame, shafts extending longitudinally upon the head and tail portions of the frame in a direction parallel to the line of flight, and each carrying a pair of driving and lifting propellers having a fixed angular relationship, means for independently or conjointly driving said propeller shafts from said vertical shaft vertically disposed propeller shafts upon the head and tail portions of the frame, each carrying a pair of superposed lifting propellers arranged to revolve within such portions of the frame, means for independently or conjointly driving said vertical propeller shaft from the central vertical shaft, a steering propeller mounted to revolve vertically on a horizontal longitudinal axis mounted upon one of the said frame portions, and means for driving said steering propeller in opposite directions from the said central vertical shaft.

FOREIGN NEWS

FRANCE

The decorating of the American flyers with the French Aeroplane Corps took place recently. Lieut. Thaw has been appointed a Chevalier of the Legion of Honor. The citation follows:

"William Thaw, chevalier of the Legion of Honor. Volunteer pilot, remarkable for skill, dash and contempt of danger. He has fought sixteen aerial fights at short range, brought down a German aeroplane on May 5 and attacked a group of three German machines the same evening and pursued them. He was seriously wounded, but succeeded, thanks to his energy and audacity, in bringing back his aeroplane, which was seriously damaged, and landing normally. He has already been twice mentioned in despatches."

Sergeant Kiffin Rockwell and Corporal Hall of the American Aviation Corps are also cited, both receiving the military medal and the war cross with palm. Their citations follow:

"Kiffin Rockwell, volunteer, wounded May 8, 1915, during a bayonet charge. An adroit and clever pilot. He brought down a German aeroplane on May 18 and attacked several on May 26, when he was badly wounded in the face. Military medal and war cross with palm.

"Bert Hall, volunteer pilot, full of skill, energy and boldness. Sent several times at his own request on extremely dangerous missions behind the enemy lines. Attacked an aeroplane on May 22, and after a severe and long fight brought it down a few yards from our trenches. Military medal and war cross with palm."

Hugh Balsley of the American Aviation Squadron, wounded recently in a battle with a German machine, continues to gain and is now able to eat.

The following members of the American Flying Squadron have been promoted to the position of sergeant:

Balsley (recently wounded), Rockwell, McConnell, Johnson and Rumsey. The position of sergeant in the French army is about the equivalent of Lieutenant in the United States army.

Had he lived, Victor Chapman would also have been promoted to the position of sergeant.

Corpl. Clyde Balsley, of San Antonio, Tex., who was wounded severely in an aerial battle near Verdun a few days ago, still is in the field hospital just behind Verdun.

Danger of blood poisoning, as a result of his wound, has passed, but the French Red Cross surgeons assert that the American aviator will be crippled for life, as a German explosive bullet entered his hip and its fragments perforated his intestines. The surgeons fear the young American aviator never again will be able to walk.

Clyde Balsley, Kiffin Rockwell, Norman Prince and their French commanding officers engaged forty German aviators about ten days ago. Prince escaped death miraculously when a German bullet cut through his leather helmet. As Balsley lay in the field hospital he was decorated with the Military Medal and the Croix de Guerre.

Victor Chapman, the American aviator with the French army, was killed on June 23rd in an air battle with a German squadron over the Verdun Sector. It was Chapman's first fight since he was wounded in the head over a week ago. At the time when he was wounded he refused to go to the hospital, but insisted on staying at the front. Chapman was twenty-six years old, and the son of John Jay Chapman, a New York lawyer.

GERMANY

On June 25th Lieut. Hoehndorf put out of action his seventh enemy aeroplane, a French biplane, near Raucourt. An enemy aeroplane was shot down near Douaumont.

A report of the aeroplane raid on Karlsruhe, June 22, shows that 110 persons, including 5 women and 75 children, were killed and 147 injured, including 20 women and 79 children. Many of the injured are expected to die.

The streets were crowded at the time of the raid because of the Corpus Christi feast.

The French official communication issued on the night of June 22 said that in reprisal for successive bombardments carried out by the Germans on the open towns of Bar-le-Duc and Luneville French aerial squadrons had bombed Treves and Karlsruhe.

GREAT BRITAIN

The following is the official British report for June 27th:

Yesterday numerous hostile air craft were encountered on the enemy's side of the line. Five of our machines engaged four Fokkers, two of which were brought down and fell out of control. Two more of the enemy's machines were brought down in the course of the day. Our casualties were one machine missing.

ITALY

An Austrian aeroplane while bombarding Verona on June 27th was attacked and brought down by Italian aircraft in the Chiampo valley. Another aeroplane attacking Padua was driven off by anti-aircraft artillery.

The official Italian report for June 21 follows:

"Hostile aircraft dropped bombs on our lines of communications, wounding a few persons and causing some slight damage. Squadrons of our Caproni and Savoia aeroplanes, in which were thirty-four machines, bombarded the aviation station at Pergine, at the head of the Sugana Valley. They were fired on by numerous anti-aircraft batteries and engaged by the aerial defense squadron of the enemy, but returned safely after bringing down three hostile machines."

JAPAN

Three aviation officers, Lieut. Colonel Kawase, Lieut. Sawada, and Lieut. Takeda, have been ordered to Europe to study military aeronautics in the Allied countries.

Mr. Yukiteru Ozaki, the son of the Minister of Justice and a promising young aviator, recently left for Shanghai by the Kamo Maru. He was accompanied by Lieu, a Chinese revolutionist who fought in the battle at Hukou in the first revolution, under the revolutionary leader Li Lieh-chun, and has been staying for some time in Japan. It is reported that Lieu approached Mr. Ozaki some time back with reference to the study of aeronautics, and while studying, the two aviators became fast friends. Mr. Ozaki took Lieu as a passenger in his flight practices at Tokorozawa last month. Mr. Ozaki was also on intimate terms with Hsieh Hsiao-hsia, an aviator attached to the revolutionary army. Naturally a rumor is rife that Mr. Ozaki had gone to Shanghai to join the revolutionists and assist them in their campaign against Yuan Shi-kai, but the rumor is denied by the Imperial Aero Association, to which Mr. Ozaki belongs. Mr. Ozaki himself declared that his visit to China was for the benefit of his health and nothing else. It was his long-cherished desire to go over to China and make flights on the continent, a desire which he has ever entertained since his flights in Chosen last year.

A revolutionary member, however, states that Mr. Ozaki and Lieu will meet Dr. Sun Yat-sen at Shanghai and will perhaps establish an aeroplane factory in Kwangtung to aid the revolutionary aviation corps, which at present does not boast a single aeroplane. It is understood that Mr. Ozaki will resign from the Imperial Aero Association before long.

The following is a report of the Japanese Aviation School for April 19:

"The graduation flights of officers of the Tokorozawa aviation battalion, between Tokorozawa and Shizuoka were concluded yesterday. Lieutenants Nishimura and Niiyama started from Tokorozawa at 7 A. M., respectively piloting Nos. 19 and 24 planes. Lieutenant Nishimura successfully reached Shizuoka at 8:55 and after a short rest left that place on his return journey, arriving at Tokorozawa without accident at 12:30 P. M. Lieutenant Niiyama piloting No. 24 plane was obliged to descend at Haramachi, beyond Hakone, on his way to Shizuoka. When alighting the plane was dashed against the ground and badly damaged so that further flight was abandoned.

On June 17 at Sapporo Hokkaido, Japan, Art Smith, the American aviator, fell from a height of five hundred feet while giving an exhibition and broke his right leg.

Smith reached Hokkaido after making a brilliant circuit of Japan. Among the numerous gifts he received were a medal presented by Premier Okuma, and a purse inlaid with diamonds, given him by the Japanese Crown Prince.

The National Aviation Society will present Mr. Art Smith with a souvenir in the shape of propellers inscribed "In honor of Art Smith, from the National Aviation Society, April 12, 1916, Tokyo, Japan." Lieut.-General Nagaoka (retired) is the president of the Society. The "Jiji Shimpo" announces its intention to present medals to any person distinguishing himself in the art of flying, and Mr. Art Smith will be the first to receive recognition from the paper.

SPAIN

Spain is becoming quite active in aeronautics, and there has been established a civilian aviation school in Getafe and two military schools, one in Cuatro-Vientos (Madrid) and the other in Guadalajara; further than this, there has recently been inaugurated a school, for marine aviation, in Santurce, which has had a grant of 100,000 pesetas from the Spanish Government. In Barcelona there has also been inaugurated a civilian aviation school, which has for its first instructor Sr. Hedilla, a Spanish aviator.

The Avro Scout, a machine of British construction, used extensively on the French front.

WRIGHT TRACTOR, TYPE "L"

In great contrast with the Wright Company's twin propeller pushers, notably for their slow flying qualities, is their latest tractor, which averages 80 miles an hour, and which in design is as much cause for admiration as its performances in flight.

The adoption of the double wing flaps in place of the usual warping wing is an extreme departure in their method of maintaining lateral control. Head resistance is reduced to a minimum in the stream lining of all exposed members, and by the bullet nose of the fuselage in which the motor is housed. The complete covering of the motor gives it the protection desirable in military tractors.

Principal dimensions of this tractor are given below; other measurements may be scaled from the scale drawing.

Span, upper plane	29'-0"
Span, lower plane	29'-0"
Gap	5'-8"
Chord	6'-6"
Area, main planes	375 sq. ft.
Tail area	50 sq. ft.
Length over all	24'-0"
Weight, net	850 lbs.
Climb, 1st minute	650 ft.
Motor	60 h.p.

Planes

Upper and lower planes are similar in size and shape. Ribs are spaced 12 inches apart and the covering is held in place with rattan strips to each rib. The center wing panel, with four struts, is fixed to the body of the machine. Single plane extensions are attached to either side of the center panel, and to either side of the fuselage.

The center four struts are not directly connected to the fuselage as in the usual method in tractors. Plane sections four inches wide are fixed near the bottom of the fuselage. The four struts rest on this section, and do not touch the fuselage.

Struts are spruce, streamline, three inches wide throughout their entire length, except at the extreme ends, where they sharply taper to fit the sockets. Strut fittings are set on "hook plate" anchorages, to which solid steel wire cross braces are attached. No turnbuckles are used in cross bracing. Standard length wires with eyes formed at each end and ferrules securely soldered are sent from the factory, ready for installation. Each wire is given a number and can be duplicated exactly in gauge and length.

Bolts hold struts to the sockets, and when removed the strut can be slipped out from between the planes, permitting the cross wires to be unhooked from the socket plate.

Fuselage

Box frame girder construction with a turtle deck, tapering from the stream line nose to a chisel termination at the rear, from which the rudder is hinged. The rudder is held in position with guy wires from top of rudder to outer edge of tail plane, and it is operated by a bar located under tail flaps.

As the drawing shows, the tail is nearly semicircular in outline, with tail flaps two feet wide hinged at the rear. Rattan strips hold the covering in place.

The fuselage forward of the planes is metal covered, and elsewhere is linen, doped, and varnished. The entire fuselage is painted gray, giving it a neat appearance.

The pilot's seat is comfortably arranged, below the trailing edge of the upper plane, and a dashboard with instruments is in plain view. Where control cables run through the fuselage, the covering is protected with metal eyelets.

The landing chassis consists of two wheels, 26" x 4", sprung on ash skids with rubber band shock absorbers. A steel axle is used, spacing the wheels 5 feet apart. The entire landing gear is cross braced and wired to the planes at either side. A shock absorbing tail skid of ash is used.

Controls

A light connecting strut is used between each pair of wing flaps, just back of the outer rear main strut. Pulleys for control cables are attached to top and bottom of these main struts, and cables from lower pulley runs to the upper flap and vice versa. Turning of the control wheel operates the wing flaps. The rudder is connected so that it turns when the wing flap is operated. A separate control for the rudder is provided. This is in the form of an arm extending from the center of the wheel terminating in a grip which travels around the circumference of the wheel. The right hand can grasp both the wheel and the rudder control, and can operate either or both controls. The tail flaps are raised or lowered by a forward or backward movement of the control wheel.

Motor Group

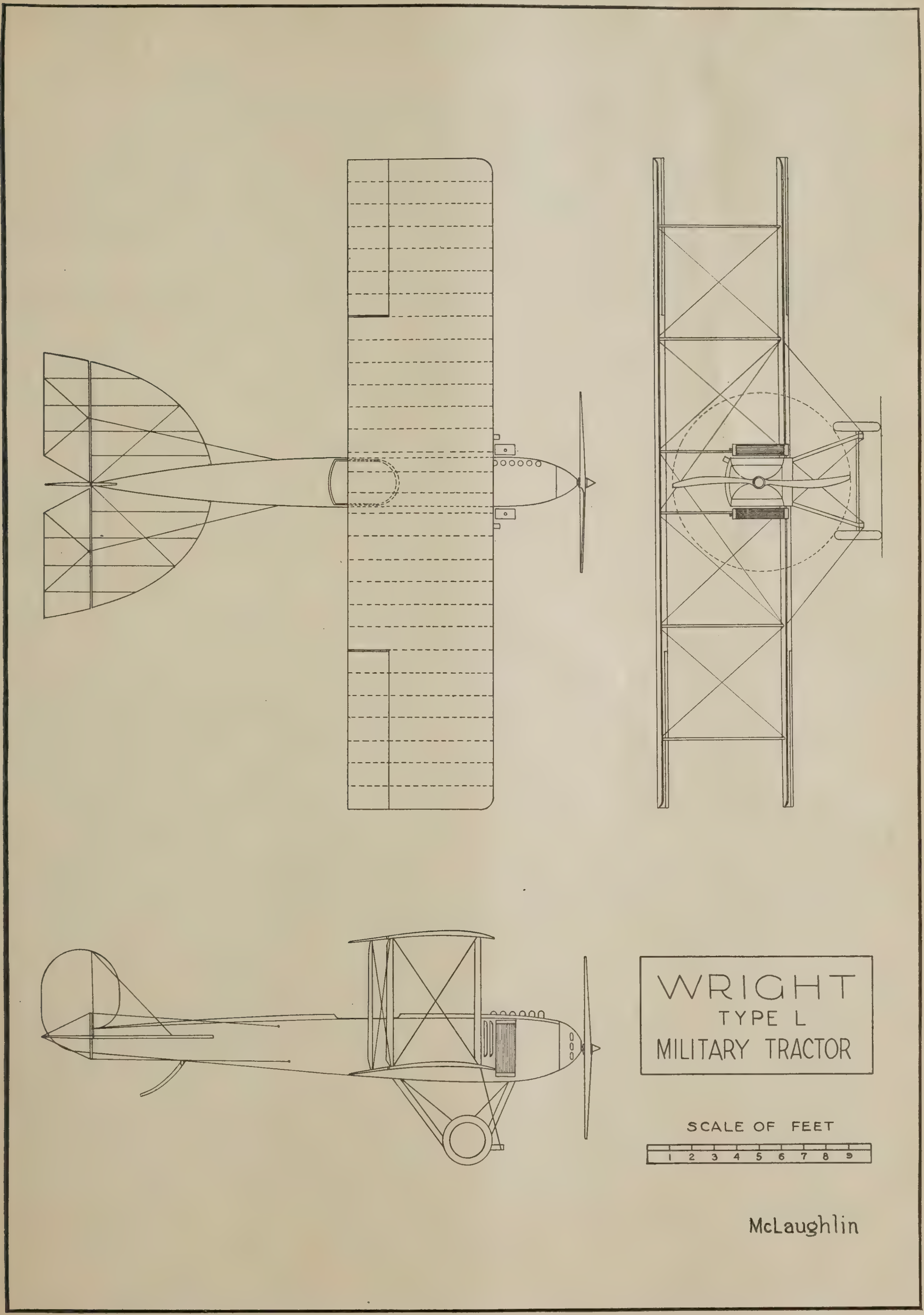
A Wright 60 h.p. motor is installed in the fuselage, and an exhaust outlet from each of the six cylinders projects from the top of the fuselage. Doors at either side of the fuselage provide access to the motor.

An unusual method of power transmission is employed to prevent damaging shocks to the light propeller, when starting the motor, and to eliminate thrust bearings. At the forward end of the motor a light flywheel is provided, in which a disk is suspended by means of sections of rubber tube. The propeller shaft is attached to this disk. When the flywheel revolves, the motion is transmitted to the disk through the rubber shock absorbers. Sudden violent turning of the motor and flywheel is transmitted to the disk and propeller in the form of a gradually increasing movement.

A specially designed propeller is used on this type machine, having an exceptionally narrow blade and with a rather high pitch. A tendency to split was found to exist in these propellers, and experiments led to covering the blades with linen, doped and varnished to a high finish.

The propeller hub is capped with a sheet aluminum cone.

Cooling for the motor is provided for in the two radiators arranged one on each of the fuselage. Each radiator is 30" high, 5" thick and 11" wide.


WRIGHT
TYPE L
MILITARY TRACTOR
SCALE OF FEET
1 2 3 4 5 6 7 8 9
McLaughlin

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
47 Churchill St., Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Buffalo Aero Science Club

After much preparation, the B. A. S. C. and all concerned have been disappointed by the calling off of the big aviation meet and exhibition, which was to be held in Buffalo, July 10-22. A large silver trophy cup, valued at $400, together with gold, silver and bronze medals, which were to be given to the model flyers at the meet, are being held by Mr. Eggena, who is communicating with the Aero Club of America on the project of conducting a sort of national contest among model flyers. If this is favorably considered, more will be arranged later.

Through the efforts of one Mr. Francis Palmer of Johnsonburg, Pa., model flying in that section is being enlivened, and local parties interested in the science or of starting a club for the purpose will please get in touch with him. Gliders are also being given much attention by Mr. Palmer and others of the locality.

The Curtiss Club, made up of members of the Curtiss Aeroplane Company, have asked the B. A. S. C. to give a demonstration of flying models, which request is being given attention.

The field meets of the club for the past few weeks have been nothing to comment on, for high winds and thunderstorms prevented flying every time the members were assembled for the purpose.

Address communications to Mr. J. W. Schreier, Secretary, No. 48 Dodge street, Buffalo, N. Y.

Texas Model Aero Club

The R. O. G. duration contest of the Texas Club was held on Wednesday, June 28, at the citizens' training camp in Fort Sam Houston. The meet was a success, although no great records were made, as all the models were practically new and had not been tried out before, as we were unable to hold an elimination contest. The main trouble was with fuselages, which were constructed of white pine. This was the first time this wood was used by this club, with a result that the frames were weaker than was expected, which made it imperative that the models could not be flown at their full power.

Nevertheless the results were better than those of last year, although all flyers had at least one bad flight, or start. The most consistent flyer of the evening was Mr. Berkeley Hunter, who was gladly welcomed back on the field, as this was his first contest this year. His model took to the air like a swallow in all trials except one, which, unfortunately, was announced as an official flight.

Mr. Carl Gildemeister had an off day, as his model had a defect that could have been remedied in the shop, but not on the field, while Hamer Smith's flights were of medium records. The result is as follows: Berkeley Hunter—First, 50 seconds; second, 36 seconds; third, 55 seconds. Carl Gildemeister—First, 10 seconds; second, 8 seconds; third, 51 seconds. Homer Smith—First, 75 seconds; second, 10 seconds; third, 73 seconds.

The meet was judged by Mr. Tom Mooney, Mr. Roy Hare and Mr. George James. HOMER SMITH.

Notice

Mr. W. P. Dean is now located in Toledo, Ohio, and invites model makers there to assist him in forming a club. Address Box 26, Station C, Toledo, Ohio.

Milwaukee Model Aero Club

By GILBERT M. COUNSELL.

The M. M. A. C. opened up its flying season June 17, at a preliminary meeting held to stimulate interest in the coming contests.

Lynn Davies made the best flight of the day, his model going 103 seconds, when it disappeared from view. Lack of good flying grounds is greatly hindering the progress of the club.

The club has received the trophy donated by Mr. and Mrs. Dyer, for competition during the coming season.

The club will display scale models in the children's reading room of the Milwaukee Public Library in the near future.

The exhibition last year attracted considerable attention, and it is hoped that the exhibition this year will attract several new members to take the place of the ones who are unable to take active part in the coming contests.

The R. O. G. model, shown in the accompanying photograph, was designed and constructed by Mr. Wallace A. Lauder, of the Aero Science Club. The model without the chassis flew a distance of 3,537 feet, formerly the world's record. With the chassis attached the model has made flights of over 100 seconds each. The description of the model without the chassis appeared in Aerial Age issue of September 27th, 1915.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

From Our Own Hashimura Togo

Editor of that Dear Aerial Age:

(Which are young in spite of name)

I hope I am pardon for not corresponding so long but truth to state my condition of health was such to prohibit use of brains and other muscular parts. After leaving London Hospital for cripples I sell crutches and leg braces of iron for sifficient currency to pay part fare to Japan. Rest of way I ride on Hon freight train as learned in America. After being deposited off by conductor several times I at last arrive in Japan and make way to Tokio where Royal school of fly are situated. At once I ask for wearabouts of Royal Minister of Aviationing. Upon being inform I go there.

"Who is this article and why am I bother with cheap looking Japanese," he negotiate to servant who are standing near like statue. As he do not reply, I draw out telegram which order me to Japan and deposit it in his hand. (I then notice to my extense horror that this are not telegram but certificate of discharge from California prison. However Hon Minister can not read English and with snagger of mistake I hand telegram.)

"If you were of noble family I should ask pardon," he say, "but Japanese law forbid asking pardon of low degree not related to Royalty. However, you are forgave delay in arrive."

"Much oblige," I return, "I am anxious at once to begin flight which shall prove to world that Japanese are intelligence in flying. Where are flying machines?"

'Art Smith, American aviator are using air this P. M.," he nib, "tomorrow you fly."

Same night I discover hon chaffeur in road wearing suit which closely resemble those of aviator. As he are unconscious from much mix drink, I borrow clothes.

Upon next day arriving I get up from cellar where I sleep and make way to aviationing grounds. Immense crowds of Japanese people are assemble. Large sign read as follows:

TO DAY HASHIMURA TOGO, FAMOUS JAPANESE AVIATOR, FLY. SMALL ADMISSION CHARGE TO SEE. PRICE VERY LOW. IF KILLED EXTRA PRICE WILL BE ASK.

Spirit throb within me. At last I am hero. With snobbery like millionair of much money but no intelligence I make way through crowd. Over on one side of field stand aeroplane which closely resemble concrete mixer. "Are this good machine," I ask of helper. "Very much so, two people killed last week, one this week," he answer with cruel snagger like doctor announcing bill. Although never fly alone before I am spirit of bravery. I clime in.

Helper start propeller and with much skill I turn machine toward stand where nobility are seated. "I will show skill," I say, "by running toward nobility and nearly arriving against them." When about ten feet in distance from stand I pull handle for graceful glide in the direction of upward. Horror! I pull wrong handle! With turn like acrobat aeroplane stand on head on top of royalty stand. Result: Three royal legs broken, six arms of nobility fracture! When I crawl from wreckage I see immense crowd rushing toward. I am now in hospital but soon will get out and start sentence for life for attempt murder, revolution, and general destruction. Wearing suit of convict I feel very criminal.

Hoping you are the same,

Hashimura Togo.

The Same Old Story

Jack Spratt bought an aeroplane,
His wife is getting lean,
For 'twixt them both
It keeps them broke
To buy the gasoline.

Flying hen drops egg, says a Sunday headline. The Zeppelin habit is spreading.

In England

Willie Firefly: "Mamma, can I go out and play to-night?"
"Yes, Willie, but dim your lights and look out for Zeppelins."

A Flying Trip

An agile young flea from Milan
Once went to the Alps with a man;
But finding the air
Disagreed with him there,
He returned on a young lady's fan.

IN KANSAS.
"Cyclone?"
"No; aeroplane."

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RALPH E. DeCASTRO
Associate Editor
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AERIAL AGE WEEKLY

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VOL. III NEW YORK, JULY 17, 1916 No. 18

Senator Johnson of Maine Asks $1,500,000 for Aerial Coast Patrol

SENATOR CHARLES F. JOHNSON, of Maine, has introduced a bill asking $1,500,000 for the establishing of the Aerial Coast Patrol, which was originated and developed by the Aero Club of America and the National Aerial Coast Patrol Commission, of which Rear Admiral Robert E. Peary is chairman.

The bill (S. 6557) is as follows:

Whereas it behooves the United States, the world's pioneer in aviation, to begin without delay the development of aviation for the benefit of the American people: Therefore

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby established the aerial coast-patrol system, in connection with the Naval Militia of the several states, and under the direction and control of the Secretary of the Navy, for the purpose of guarding our coast line and training as aviators the aviation section of the Naval Militia of every state where the same is established.

SEC. 2. That the Naval Militia of every state shall be furnished with a suitable course of instruction, one or more hydroaeroplanes, and a competent instructor or instructors, provided it contains the requisite number of an aviation personnel as stipulated by the Secretary of the Navy.

SEC. 3. That the provisions of this act shall apply to inland as well as coastal states: *Provided, however,* That in all cases a suitable body of water therein is ascertained by the Secretary of the Navy to be available for the operation of hydroaeroplanes.

SEC. 4. That there is hereby appropriated out of any moneys in the Treasury not otherwise appropriated, the sum of $1,500,000, to be made immediately available to carry out the provisions of this act.

In endorsing this bill Mr. Henry Woodhouse, of the Board of Governors of the Aero Club of America, wrote to the members of the Senate Naval Committee as follows:

Hon. Benjamin R. Tillman,
Chairman Committee on Naval Affairs,
United States Senate,
Washington, D. C.

My dear Senator Tillman:

The sinking of the "Lusitania" less than ten miles from the Irish coast could never have taken place if the coast had been protected by a system of aerial coast defense, such as has been proposed by the Hon. Charles F. Johnson, Senator from Maine. A few million dollars employed in such a system of coast defense would have prevented that awful tragedy.

At the time of the "Lusitania" tragedy Great Britain had only fifteen aviation stations; to-day it has ninety-four stations, and it has hundreds of anti-aircraft gun squads. It behooves us to learn the lesson now.

In case of war nothing else could afford as good protection to our shipping and shipping centers, and the people living along the coast, as en efficient system of aerial coast defense.

It costs only $1,500,000 to establish a chain of stations along our coasts, the stations to be one hundred miles apart, each having four aeroplanes and a personnel consisting of four aviators, four observers, a wireless operator, and mechanicians and assistants.

Recently an officer of a foreign country stated that this system of Aerial Coast Patrol is an admirable conception, most efficient and economic.

We have in the past six months received applications for assistance to train officers and supply aeroplanes for the Naval Militia from every state of the Union which has such an organization, also from civilian organizations in different states. In quite a number of states the first steps have been taken to organize units of the Aerial Coast Patrol. All that is needed is the encouragement and support which Senator Johnson's bill will provide.

We hope, therefore, that you and your committee will give your hearty approval to Senator Johnson's bill.

Very sincerely yours,
HENRY WOODHOUSE,
Member, Board of Governors.

Commanding Officers of National Guard Divisions Urge Aero Club to Organize Aero Squadrons

TELEGRAMS urging that steps be promptly taken to organize aero squadrons for the National Guard divisions have been received by the Aero Club of America from Major Gen. John F. O'Ryan, commanding the New York National Guard troops at McAllen, Texas; Brig. Gen. B. W. Hough, commanding the Ohio National Guard, now at Laredo, Texas; and Adjutant General Harry T. Herring, commanding the New Mexico National Guard, at Columbus, N. M.

Although the tables of organization provide that the twelve militia divisions be each supplied with an aero squadron, consisting of twelve aviators and three aeroplanes to each aviator, Congress' failure to allow the appropriations for training National Guard aviators and organizing and equipping the squadrons resulted in sending the twelve divisions of the National Guard to the Mexican border without aeroplanes. This condition is most deplorable, since a well-equipped aviator is worth at least a thousand soldiers at the Mexican border, and 200 aviators could protect the American lives and American property at the border better than thousands of soldiers.

Last year, when Congress went out of session without providing the appropriation necessary for organizing the twelve aero squadrons for the twelve divisions of the National Guard, the Aero Club of America established the National Aeroplane Fund, with which it began training 60 National Guard officers of 35 different states.

Responding to the club's appeal for suitable officers and men to train in aviation the Adjutant Generals of the 48 states sent to the club not less than 500 names, showing that the National Guard can supply the men needed, and is anxious to organize aero corps.

When the conditions at the Mexican frontier became worse, and it became evident that the National Guard would have to be called to service, and it was found that the army had only fifteen aviators and twelve aeroplanes, when there should have been at least 200 aviators, with three aeroplanes each, the Adjutant Gnerals of the different states asked the War Department to provide for the training of National Guard officers and to supply the equipment needed to organize the aero corps. The War Department then drew up a plan for organizing the twelve aero squadrons and submitted it to the Military Committee of the Senate, which promptly approved and reported it to the Senate. The measure carries an appropriation of $13,081,666 for organizing, equipping and maintaining twelve aero squadrons, which figures at $800,000 per aero squadron, over two-thirds of which goes towards the upkeep of the squadron and providing the motor trucks, motorcycles, mobile repair shops, mobile oil tanks, and other equipment necessary to make the aero corps self-sufficient. This measure is now being considered by the House conferees: Congressman James Hay of Virginia, Congressman S. Hubert Dent of Virginia, and Congressman D. R. Anthony, Jr., of Kansas.

While this measure did not originate in the House, it is expected that, seeing the urgent need of these aero squadrons, Congressman Hay will not oppose it. The appointment of Congressman Dent as one of the conferees is by no means assuring, as in the past Mr. Dent has always accepted the judgment of Mr. Hay in such matters. Last year Representative Dent was one of the conferees, and with Representative Hay, forced the Senate conferees to cut down the appropriation for army aeronautics from $400,000 to $300,000 which was the sum which Mr. Hay had originally put through the House of Representatives.

Recently Mr. Hay defeated in the House of Representatives the amendment proposed by Congressman Murray Hulbert of New York, which provided for $14,000,000 for army aeronautics, instead of the $1,222,000 allowed by Congressman Hay in his Army Reorganization Bill. Due entirely to his obstinacy, the present appropriation for army aeronautics is only sufficient for one and one-third aero squadrons, which is only one-tenth of what the army actually needs.

Major Gen. O'Ryan, in his telegram to Mr. Alan R. Hawley, President of the Aero Club of America, says:

"I am strongly of the opinion that the National Guard divisions should be immediately provided with adequate aero squadrons."

Adjutant General Hough, of Ohio, says:

"Conditions observed by me show that aero squadrons are necessary, and would be of great benefit."

Adjutant General Harry T. Herring, of New Mexico, says:

"Having been on the border since May 12 with the New Mexico National Guard troops, I am of the opinion that the best method for patrolling the international boundary is by the use of aeroplanes for scouting purposes in connection with troops. A number of instances have occurred in the past two months which caused me to hold the above opinion and I believe that with the proper support of the Federal Government the National Guard is competent to handle this service."

As the need for aero squadrons in the National Guard is so imperative, the Aero Club of America will make every effort to secure the House conferees' approval of the appropriation needed to organize twelve aero squadrons.

Harvard Men Form Aerial Reserve

THE first nine Harvard men to take up aviation to form an aerial reserve under the auspices of the Aero Club of America and the Harvard Undergraduates Aero Training Fund have reported to the Curtiss Aviation School at Buffalo for training. These men will be trained by Lieut. Philip Rader of San Francisco, who has just returned from Europe, where he served in the British Royal Flying Corps, and flew at the front in France. Lieut. Rader has a record of having made over 2,000 flights in the last two years, and never having broken a wire. Due to his experience abroad, he is probably better versed in military flying than any other aviator in this country.

To encourage this movement, the Aero Club of America and Mr. Robert Bacon offered a bonus of $50 for each of the Harvard men who takes his aviation pilot certificate. Following this offer, a committee was formed of Harvard graduates to raise a fund to train the undergraduates. The contributions to this fund today amount to $4,683.51,and permission to call for about $2,400 additional if necessary. The expense of tuition is approximately $400 per man. $10,000 more is needed to carry this plan to completion, and the committee invites subscriptions. Checks should be made payable to the Undergraduates Aero Training Fund, 40 Water St., Boston, Mass.

The Executive Committee in charge of the collection and distribution of the money is as follows: William Thomas, George von L. Meyer, G. Richmond Fearing, N. Penrose Hallowell, Allan Forbes, Eliot Wadsworth, Philip A. Carroll, S. Huntington Wolcott, E. V. R. Thayer, Charles E. Perkins, Benjamin Joy, A. J. Drexel Paul, Roger Amory and Gordon H. Balch.

A large number of applications have been received by the committee in charge. The first nine selected are as follows: Messrs. Frederick S. Allen, Pelham Manor, N. H.; Francis T. Amory, Jr., Boston, Mass.; Edmond H. Bates, W. Medford, Mass.; William B. Bacon, Brookline, Mass.; M. Philip Bryan, Brookline, Mass.; Hamilton Coolidge, Brookline, Mass.; Donald D. Harries, Minneapolis, Minn.; Harry H. Metcalf, Westboro, Mass.; Joseph R. Torrey, Worcester, Mass.

The Curtis Aerodrome in Buffalo is seven miles from the city, and it was, therefore, decided that the men should live in tents near the hangars. A good camp site was obtained about 100 yards from the field, tents were ordered and arrangements with a caterer to run a tent restaurant were consummated. The expense to the men is $15 down for the tents and $10 a week for board.

In transmitting the offer of the Aero Club of America and Mr. Robert Bacon, Mr. Henry Woodhouse, member of the Board of Governors of the Aero Club, pointed out that this movement would not only be beneficial to the nation, but would also be of great benefit to the men actively participating in the movement.

Mr. Woodhouse's letter to Mr. Roger Amory, Chairman of the Executive Committee of the Undergraduate Aero Training Corps, follows:

"The Executive Committee of the Aero Club of America has been very much impressed by the patriotic spirit of the Harvard graduates and undergraduates who formed the Harvard Aero Corps for the purpose of instructing Harvard men in aviation.

"Earl Kitchener recently stated that 'an aviator is worth an Army Corps.' We know that had we had fifty aeroplanes for the Mexican campaign the history of this campaign would read quite differently, and many American lives would have been saved and American property protected from the destruction that resulted from having American communities unprotected and exposed to attack by Mexican bandits.

"With 5,000 aviators in reserve, who could very well be employed daily in peaceful pursuits, this country would be in the position of the porcupine, which goes about its daily peaceful pursuits, harms no one, but is ever ready to defend itself.

"The present war, in proving that an aviator is worth an Army Corps, has also shown that a man who has had sufficient training in aviation to make a good observer, having sufficient training in piloting the aeroplane so as to be able to properly land the machine if the aviator is shot while flying, is worth at least 200 soldiers; while a man who has had less training in aviation, but at the same time sufficient training to enable him to know the operation of an aeroplane, is worth at least 100 soldiers in connection with the anti-aircraft gun service—the service upon which devolves the duty of defending cities against aerial attacks.

"Considering these things, and considering that it is such a hard problem to get officers and men from the ranks of the Army and Navy to train in aviation, the Army and Navy being so short of personnel that a large part of our coast defenses and battleships are alarmingly undermanned, your movement deserves the heartiest support and co-operation.

"An ideal plan for the Harvard Aero Corps to consider would be to select 24 men to be trained in aviation to form a corps consisting of eight pilots, eight observers, and eight anti-aircraft gunmen. These 24 men should all receive aviation training, and while being trained, those in charge would easily see which among them would adapt themselves best for the three branches, i. e., operating, observing, and anti-aircraft gun service. In the first there would go those men who have shown natural aptitude for flying; in the second would go those who have shown special aptitude for observing; in the third would go those who, having had a complete or only partial course of training, are found to be best adapted for the anti-aircraft gun service.

"These twenty-four men can receive their aviation training at some of the established aviation schools, or arrangements mey be made to either rent or buy three or four aeroplanes necessary for the training. The Massachusetts Militia is anxious to organize an Aero Corps, and some arrangement may be made to train the Harvard men under the auspices of the Militia. This is, of course, only a suggestion.

"Knowing the 'spirit of Harvard,' we have no doubt that such a plan will receive the full support of Harvard graduates.

"We discussed this matter today with Mr. Robert Bacon, and the general sentiment was that nothing better could happen in the interest of national defense than to have such an organization as outlined above in every University in this country—and we were gratified at finding the prospect of having Harvard gain the distinction of being the first University to organize such a valuable body.

"Wishing to contribute towards realizing this plan, the Executive Committee of the Aero Club of America and Mr. Robert Bacon decided to give $50 to each of the first 24 Harvard men to learn flying and secure their aviation pilot's certificate.

"While providing a valuable reserve to meet an emergency, this project will open many stupendous possibilities for the men who become connected with it.

(*Continued on page* 547)

THE NEWS OF THE WEEK

Aero Club Organized in Vermont

The interest the citizens of Burlington are taking in their state was made manifest on July 5 at the state encampment by the large number of people who gathered there to hear men of national prominence discuss the advisability and pressing need of an aero club for Vermont.

Governor Gates, Rear Admiral Robert E. Peary, discoverer of the North Pole and chief of the coast patrol station, and Augustus G. Post were the principal speakers.

At the close of the meeting the following officers of the Aero Club of Vermont were elected: President, James Hartness, of Springfield; vice-president, Adj. General Lee S. Tillotson; secretary, James P. Taylor, of this city; treasurer, H. R. Roberts, Dean of Norwich University. The governing board is as follows: Governor Charles W. Gates of Franklin, Colonel Ira L. Reeves, commanding First Vermont Infantry, Major Wallace Batchelder, commanding First Vermont Cavalry, Clarke C. Fitts of Brattleboro, Horace F. Graham of Craftsbury, Redfield Proctor of Proctor, W. A. Scofield, and James P. Taylor of Burlington, and James Hartness.

Admiral Peary, in the course of his address, congratulated Vermont on her preparedness not for war but against it, which, as he said, should be the purpose of all preparedness.

The principal theme of his address was aviation, the conquest, as he termed it, of an entirely new world. Although America gave flying to the world, he said, although in 1909 the first army plane in the world was in the United States Army and in 1911 the first seaplane in our navy, to-day we have perhaps one hundred aeroplanes in comparison to Germany's 9,000 or more. Even little Bulgaria has 300.

The speaker also stated that to him the marine part of the aviation corps is of the most importance. He mentioned Lake Champlain as being an ideal spot for the hydroaeroplane.

In closing he said that Vermont was setting the example for other states to follow. She was paving the way for a great and wonderful science, that of flying. He urged the citizens to support the project so as to enable the corps to buy machines.

The applause at the end of the Admiral's speech was loud and prolonged. The cavalry gave him three rousing cheers.

Augustus C. Post told of the work that had been done in the aviation line in this country. He also outlined the plans that men interested in this work had for the future. As Admiral Peary had done he urged the citizens to support the Aero Club. Mr. Post's address aroused great enthusiasm.

Metal Propellers for Border Aeroplanes

Army aviators are considering the use of aluminum alloy blades in the place of wooden propellers on aeroplanes subjected to the terrific heat conditions in Mexico and along the border. After months of experiments, officers of the aviation section of the Army Signal Corps are beginning to believe it impossible to discover a wooden blade that will not split.

The metallic blade to be tried will be made of an alloy whose base is aluminum. This will be cast in block form and tooled to the required shape of the blade. A very light sheet-steel covering will frame this core. The result will be a lighter blade than those of mahogany or other woods, and it will not splinter.

Reports from Gen. Pershing indicate that the last aeroplane available for scout service has gone out of commission through the breaking of its propeller while being flown by Lieut. Christie. The other twelve machines on the border have been out of service more than a month, due to propeller trouble.

Aviation Demonstration for National Educational Association Members

The Aero Club of America, in co-operation with the New York *World*, AERIAL AGE and *Flying*, tendered to the members of the National Educational Association at its convention in New York City, a special exhibition of aeronautics at the Sheepshead Bay Speedway. Every state in the union was represented and great enthusiasm was evinced in the flying demonstration and in the stationary exhibits.

The demonstrations were made by H. W. Blakely, instructor and chief pilot in the L. W. F. flying school at Sheepshead Bay.

His machine was a Loew, Willard, Fowler, all steel, military biplane weighing 1,100 pounds, with a carrying capacity of 500 pounds. He made three flights winning much applause from the crowd, among whom were hundreds who had never seen an aeroplane in action.

No effort at spectacular flying was made. The object of the demonstration was wholly educational as to the battleplane.

The biplane was brought close to the grandstand, and, with Announcer Johnny Dunn at the megaphone, Augustus Post, pioneer aviator and a governor of the Aero Club of America, dictated the main points of construction and ingenuity of the modern flyer.

After the third flight the spectators were invited to the field

The Kite Balloon presented to the Ohio National Guard by the Goodyear Co. It embodies many scientific principles which have been worked out exclusively by the Goodyear aeronautic engineers.

Mr. H. W. Blakely, who rendered such excellent service in demonstrating the potentiality of the aeroplane at the Aviation meet at Sheepshead Bay organized for the National Educational Association members.

for a closer inspection of the battleplane and to receive explanations of points that might have not been made clear.

As the crowd surged into the field a picturesque feature was furnished by the Ridgewood Battalion of Boy Scouts, under command of Major L. W. Harrington and First Lieut. John Conway, and a company of the Naval Branch of the Scouts, under Commodore L. F. Trimm. The little fellows in khaki and white ducks marched with admirable smartness across the field and stood as a guard of honor about the aeroplane.

In the space they held Aviator Blakely was introduced by Mr. Post, who explained further while the flyer demonstrated the working of the propeller, rudder, stabilizing wings and other features.

It had been hoped to conclude the educational afternoon with the appearance of other aeroplanes to afford a spectacle, and the Aero Club had received several promises from well known aviators, but in the rush of preparedness, the training of militiamen, the day and night work in the aeroplane factories, this phase of the programme could not be carried out.

A special educational number of *Flying* was furnished to each member of the National Educational Association attending. This issue contained an illustrated history of Aviation since its inception written by Mr. Henry Woodhouse, Governor of the Aero Club of America, and will constitute a text book for use in various schools and upon which will be based an essay competition amongst the scholars.

Organize Aviation Reserve in Chicago

The first squadron of the United States central aviation reserve was organized at a meeting at the Stratford hotel, Chicago, on June 29. Charles Dickinson, president of the Aero Club of Illinois, presided, and Charles G. Dawes, president of the Central Trust Company of Illinois, was elected treasurer of the reserves.

The purpose of the organization is to train volunteer aviators for possible military service in the event of war. Officers of three companies were elected and arrangements were made to muster 194 men required for regular army strength.

It was decided to raise a fund of $20,000 required for the purchase of two army flying machines and for their upkeep and the maintenance of a school of instruction for recruits. Fourteen hundred dollars was pledged toward the fund. The officers of the three companies of the squadron are:

Company A—Capt. Jack Vilas, hydroaeroplanes.
Company B—Capt. W. C. Woodward, land flyers.
Company C—Capt. Frank Champion, land flyers.

Company A starts with nine aviators, Company B with seven and Company C with eight, all of whom will be made officers in their respective companies.

Among those enlisting at the meeting were: Walcot Blair, William Blair, A. H. McCormick; R. J. Sestak, licensed aviator; Lee Hammond, licensed aviator; Harold Wilder, Anderson Devoe, H. Mallgrave, S. J. McNamara, E. J. Grant, Lou Heinemann, B. F. Rodgers, Jr., C. N. Black, J. C. Love and J. R. Haydon.

Telegrams were received from many parts of the country from flyers desiring to join the reserves. Miss L. R. Hornsbee wired from New York that she is a Wright aviatrix and a Chicago girl and wanted to enlist.

Lieut. Marburg to Return to England

Lieut. Theodore Marburg, Jr., of the Royal British Aviation Corps, son of the former minister to Belgium, has received orders from the British War Office to report for duty with the Aviation Corps in London on September 5. Last December Lieutenant Marburg was wounded in action in France by a fall from his aeroplane, which resulted in the loss of his leg.

One of the machine rooms at the Buffalo plant of the Curtiss Aeroplane & Motor Corporation.

Aeroplane Guns to be Tested

One of the most interesting experiments of the present tactical manoeuvres of the Atlantic fleet will be the testing for the first time of the aeroplane guns mounted on board the Texas, in the sixth division, in command of Rear Admiral Augustus F. Fletcher. These guns were mounted on top of the forward and aft turrets of that battleship at Boston and will be put to an actual test for the first time this week. They are of three-inch calibre and are designed to make their range complete from any quarter.

Although no flying boats will accompany the fleet, kites on board the various other battleships of the squadron will furnish targets for subcalibre practise. The Texas is the first ship of the United States Navy to be equipped in this manner, and members of the war college here are much interested in the outcome of the experiments.

Standard Aeroplane Co. News

An increased staff at the Standard Aeroplane Co. Works at Plainfield, N. J., is working overtime on the aeroplanes ordered by the army department. The order for twelve aeroplanes was received by Pres. H. B. Mingle after an an official board of experts had made thorough tests of one of their machines.

Mr. Mingle is General Counsel for Mitsui & Company, Limited, the largest Japanese banking and commission house in the world, but states that as stockholders, Japanese capital is in no way associated with the Standard Aeroplane Company.

Mr. Mingle, it may be added, is a distinguished member of the New York bar, with offices in the Woolworth Building, and is a man of high standing in professional, business and financial circles.

He is a native of Lock Haven, Pa., and is about forty years of age and was graduated from the University of Pennsylvania, with the degree of B. S. in Econ., in 1899, and from the New York Law School, with the degree of LL.B., in 1902. He is a member of Delta Upsilon, Philo., the University Club, Philadelphia; the University of Pennsylvania Club of New York City, of which he has been Secretary from 1899 to the present time; Graduates' Club of New York City, of which he is President; Delta Upsilon Club of New York City, of which he is Vice-president; General Alumni Society, of which he is a Director; American Bar Association, New York State Bar Association, Essex County Country Club, Japan Society, Academy of Political Science in the City of New York, the Pennsylvania Society, etc.

Lieut. Rader Back from France

Lieut. Phil Rader has arrived in this country from "somewhere in France," where he was one of the air pilots of England's royal flying corps. He is to superintend the transportation of several aeroplanes to Columbus, N. M., where

Mr. Phil Rader, who was attached to the Royal Flying Corps, and who is now in Buffalo tutoring the ten Harvard aviation students.

they will be used in the government's service as scout flyers.

"I am more than glad to get back home," said Lieut. Rader, "for I have had my share of the dangers of war. I put in nine months in the aerial service of the allies' armies and six months in England as a 'Zep strafer'—one of the corps of fliers held to fight off the Zeppelin raiders."

Lieut. Rader left France on June 7 and had just reached his home in San Francisco, where he has a wife and baby, when he received the call from the Curtiss company to come East. He said he was shocked at the unprepared condition in which the United States finds itself as regards aeroplanes for fighting and scouting purposes.

A section of the plant of the Ashmusen Motor Co. at Providence, R. I.

Pacific Flyers Eager to Serve

Members of the Pacific Aero Club, having volunteered to place eight aeroplanes and three observation balloons at the service of the California National Guard, are eagerly hoping that their offer will be accepted.

"Our members are anxious to make good their offer," President Irvine said. "Three of our aviators—Roy Francis, Frank Bryant and Harvey Crawford—have signified to me their desire to serve the National Guard, and I am satisfied enough other flyers in our ranks will be equally willing to go, so that the eight machines we have offered would be well piloted.

"Ed Unger has offered his services, through me, with observation balloons."

The membership of the club includes both seasoned aviators and capitalists with an interest in aviation. The Christoffersen brothers—Harry and Silas—are members. So is Adolph Sutro, grandson of the former mayor, who was the first pilot to win a pilot's license with a hydro-aeroplane.

Christofferson News

The Christofferson Aircraft Co. of San Francisco will move its plant from Oakland, Cal., to Redwood City, twenty-five miles south of San Francisco. The school of flying is already established on the new field and the first lessons were given the twenty-six pupils today by Mr. Frank Bryant, chief instructor. The plant is located a short distance from San Francisco Bay.

There is scarcely a day during the entire year that flying cannot be done. Redwood's perfect climatic conditions make this possible. Mr. Bryant flew two of the school machines from San Francisco to Redwood City last week, and said one must fly an aeroplane to appreciate the splendid air conditions at Redwood.

The Christofferson school is using five machines of the pusher type, shoulder fork control, for teaching, also one tractor plane with the Depperdussin control. Two other planes are nearing completion at the plant with Farman control.

Chicago News

By A. E. Nealy.

The Fourth in Chicago witnessed an exodus of almost the entire aviation colony at Ashburn. Of those that have returned, all, except one, state that the exhibitions were most successful. Mr. Laid, who flew in Butte, Montana, made two night flights on the 3rd and 4th, and two day ascensions. The location of the exhibitions was at a very high altitude. Mr. aid, however, succeeded in looping several times.

Miss Catherine Stinson had dates in Canada on both the 3rd and 4th.

Miss Marjorie Stinson made three day flights on the Fourth in Chicago Heights. All three proved very successful. Mr. Sinclair gave an excellent exhibition with his Stupar Tractor at Anna, Ill. Mr. Kastory also flew in Illinois, but has not yet returned to the field.

Goodyear Presents Balloon to National Guard

As material and practical evidence of its desire to co-operate fully with the Government in building up the national defense, and its interest in the national preparedness program, The Goodyear Tire & Rubber Company, Akron, Ohio, has presented to Battery "B," Ohio Field Artillery, stationed at Akron, a fully equipped military kite balloon ready for immediate use. Thus Goodyear earns the distinction of furnishing the first kite balloon ever owned by the National Guard in any state. The balloon is of the same type as the one recently delivered to the U. S. Navy for use at the Naval Aeronautic Station at Pensacola, Florida. It was designed and made entirely in the Goodyear factory. Goodyear recently sent an aeronautic expert abroad to make a scientific study of kite balloon development, to be better able to assist the U. S. Government in building up its aeronautic service.

The balloon just donated to the National Guard is the very latest development in kite balloons and embodies many scientific principles which have been worked out exclusively by Goodyear aeronautic engineers.

The importance of kite balloons in present-day military campaigns is emphasized by the multiplicity of balloons now in use in Europe. On the European battle fronts they are placed at frequent intervals to insure aerial surveys of the entire front constantly, and are indispensable.

Undoubtedly Goodyear's gift to the Ohio National Guard will mark the beginning of a very considerable development in this exceedingly important arm of the service.

Aeroplane Wireless Tests

Sending a radio message twenty miles from a military aeroplane flying at an altitude of 5,000 feet was the achievement recorded by Capt. C. C. Culver, U. S. A., aeronautic radio expert attached to the signal corps training school at San Diego, it was announced to-day.

By arrangement with Dr. R. O. Shelton, an amateur wireless enthusiast, Capt. Culver sent his message from an aeroplane piloted by Sergeant William Ocker, of the army aviation school. Dr. Shelton heard each dot and dash distinctly and was convinced he could have kept in communication with Capt. Culver at a distance of seventy-five miles. The instrument used was a modification of the aeroplane radio set used by the French flying corps. Experiments in receiving messages while in flight will be made soon by Capt. Culver.

Seventh Regiment Cannot Accept Belmont Gift

If the United States regulations permitted the Seventh Regiment would have an aeroplane on the way from New York.

Colonel Fisk received a dispatch from August Belmont, a veteran of the regiment, asking if the regiment would accept an aeroplane. Mr. Belmont offered to equip his old command with the latest model of aircraft if the regiment could make use of it. Inasmuch as infantry regiments are not equipped with flying craft, which are under a special branch of the service, Mr. Belmont's offer was declined.

Miss Quinn, Mrs. Blakely, Mrs. Quinn, Mr. Sweetwood and Mrs. Fowler, with the L. W. F. military tractor as a background.

A Telegram of Appreciation

A telegram has been sent by the Aero Club of America to the citizens of the town of Ripon, Wisconsin, commending them for their patriotic action in requesting Congress to divert the $75,000 recently appropriated by Congress for a post-office at Ripon, and use this amount of money to develop the U. S. Army Aviation Service. The telegram is as follows:

"The Mayor,

"Ripon, Wisconsin.

"The Aero Club of America wishes to congratulate the Common Council, the Commercial Club and the people of Ripon, Wisconsin, for their splendid demonstration of patriotism and public spiritedness in requesting Congress to ask that the appropriation of $75,000 allowed for a post-office be diverted for the acquisition of aeroplanes for the Army.

"It is a practical demonstration of Americanism, of which the citizens of Ripon may well be proud, and sets a new standard for other communities to follow.

"We are merely taking the first steps toward organizing an Air Service, and in the Mexican trouble we are paying dearly for having neglected this potential arm in the past. Had we had fifty aeroplanes at the Mexican border, Villa's raid on Columbus might never have taken place. Had we had aviators and aeroplanes to rush to the border after the raid, Villa and his bandits could easily have been rounded up, but we did not have them, and the new trouble finds us with only twelve aeroplanes and fifteen aviators, where we should have at least 200 aviators with three aeroplanes each. Such patriotic acts as yours should convince Congress that the country demands that steps be taken immediately to allow the $21,500,000 that is asked for by the Army officials for training aviators and establishing aviation centers and providing aeroplanes for the Army.

AERO CLUB OF AMERICA."

The Mayor of Ripon replied as follows:

"Please accept thanks of this community for your courteous wire 28th. Believe we express general sentiment in asking extension aviation service. Find certain difficulties developing in Washington. Chairman House Committee, public buildings and grounds wires will have to be straight out repeal as they can attach no conditions and that they will gladly repeal our appropriation if we do not wish public buildings. We want immediate effective diversion of this appropriation to purpose named in our original petition and have so wired him. Letter follow. L. W. Thayer, Mayor."

This is another evidence that the world is getting better—and the Aero Club can always be relied upon to encourage anything that should be encouraged.

Curtiss Company Declares Dividend

The Curtiss Aeroplane Company has declared its initial semi-annual dividend of 3½ per cent., placing the $6,000,000 of preferred stock on a 7 per cent basis. The dividend is payable July 15 to stock of record July 1.

Boeing Tests Hydroaeroplane

The new hydroaeroplane constructed by W. E. Boeing, president of the Northwest Aero Club, has received its initial flight tests, and has passed through them most successfully.

Mr. Boeing has reason to be proud of the new craft because she has many distinctive features which were worked out by himself. She is powered with a 135-horsepower Hall-Scott aeroplane motor. Her upper plane has a spread of fifty-two feet, while the lower is ten feet shorter. Her aileron surface is smaller than is customary, and her tail planes are the products of Mr. Boeing's laboratory work. The two pontoons on which the craft is mounted, catamaran fashion, were designed by Mr. Boeing and built at Oxbow by Ed Heath, the veteran shipbuilder. The whole craft weighs 2,800 pounds.

"I'm going to have lots of sport with this ship," exclaimed Mr. Boeing, when he alighted after the first flight. "She responds readily to every control. She is very sensitive."

No one in the Northwest is as greatly interested in developing aviation as a sport as well as a serious instrument for national defense as W. E. Boeing.

Pittsburgh Aviation Camp Proposed

The Pittsburgh preparedness camp on the Allegheny river, which is conducted under the auspices of the Young Men's Business Club, may have an aviation squad. Work on improvements at Ross Farms Camp is being rushed and it is planned to use the big flat valley as the aviation field.

Pittsburgh has a number of experienced aviators who have expressed their willingness to train others in the operation of airplanes. From inquiries already received it is said there should be no difficulty in organizing a squad of more than 100 aviators ready to answer their country's call.

Atwood Aeroplane for Pennsylvania Militia

Harry N. Atwood, of the Atwater Aeronautic Co., of Williamsport, is working on a military aeroplane for Battery D, First Field Artillery of Pennsylvania. Work on the machine is rushed at the Williamsport plant and it is hoped to have it completed before the battery leaves Mt. Gretna. This will be the only aeroplane owned by the Pennsylvania troops. Mr. Atwood carried on all his experimental work in this city at the S. G. V. Co. plant on North Eighth street, where he perfected a new type 12-cylinder motor, designed for aeronautics.

Personal Pars

Creighton Hale, now starring in the feature picture of the Frank Powell Productions, Inc., has become a member of the Aero Club of America.

Mr. Hale recently addressed the Harlem Board of Trade on the adaptability of the aeroplane in modern warfare. Mr. Hale has agreed to form an Aviation Corps among his co-workers in the motion picture industry, and in the event of trouble between this country and any other nation, Mr. Hale assured the Board of Trade that he would be willing to leave for the front at any time.

Students at the Christofferson Aviation School at Redwood City, California.

AVIATION ENGINES

By J. G. VINCENT
Vice-President of Engineering, Packard Motor Car Co.

AT the beginning of the war there was no settled opinion in Europe with respect to the proper number of cylinders and the best cylinder arrangement, or indeed many other details in aircraft engine design. The only concerted plan possessed by any foreign government was that of Germany, who was contented to leave the task entirely in the hands of the automobile engineers. The latter naturally made use of their automobile knowledge, making the aircraft motors just as they would have built engines for a racing car. This produced a high speed motor with a high volumetric efficiency but not astonishingly light to the proportion of the power developed.

The Mercedes is the best known German aviation engine, and readers of *The Automobile* are all familiar with its construction and its reliability. It is nothing more than a good vertical six-cylinder in which lightness is obtained by making every possible use of very strong materials. In France development was around an entirely different line and before the aeroplane had demonstrated its military value there were many French aircraft engineers who, being rather ignorant of automobile engineering, developed peculiar engines aiming principally for intrinsic lightness.

Owing no doubt to the great success of the Gnome rotating cylinder engine there was a strong tendency in this direction and rotary engines were developed to a point where their volumetric efficiency was high and they produced a remarkable power per pound of weight. Repeated trials, however, showed that the typical French engines seemed unable to make very long flights while it was common knowledge that the need for frequent tearing down, cleaning, etc., was a distinct trouble. Long before the war it was pointed out that in figuring the weight of an aircraft engine its consumption of fuel and oil should be taken into consideration, because if this were not done the true weight efficiency of the engine would not appear.

Long Flights the Problem

Under war conditions scouts are required to make long flights and the enormous bulk of fuel and oil needed by most of the French motors made them undesirable for anything except very short trips. For long flights the water-cooled engine of much higher fuel efficiency was actually lighter as well as being more reliable. Realizing that something had to be done, and done quickly, the French automobile industry was appealed to, thus receiving official backing which had produced the Mercedes motor in Germany.

Some of the French engineers followed the Mercedes lead, building water-cooled six-cylinder engines. Others already had air-cooled eight-cylinder or twelve-cylinder V-type engines and these, together with newcomers, commenced to make water-cooled six-, eight- and twelve-cylinder engines in addition. In England development had been somewhere between the German and the French system so that the British machines were usually better fitted than French.

Despite the apparent strong tendency toward the elimination of the old idea of an aeroplane engine and the substitution of something much more like an automobile motor, it is to be doubted whether there will ever be one ultimate type. Some of the rotary cylinder air-cooled motors have done excellent work in very light scout machines possessed of extreme speed and with ability to rise very rapidly, and it may be this type of engine will continue to find its scope in this field. As soon as it is necessary to carry much weight, such as passengers and ammunition, etc., so far as can be ascertained it is the fixed cylinder type of engine which is used almost invariably.

Leaving the rotary motors on one side and confining consideration solely to the fixed cylinder pattern, there are a number of varieties from which to choose. The four-cylinder is not admissible, partly owing to its inherent vibration and partly because its dimensions would need to be very large if adequate power were to be obtained. The typical German pattern of six-cylinder can be made to give excellent service, but even with six-cylinders we soon come to the practical limit of power.

Width Is a Limit

Using gasoline, we obtain a certain temperature of explosion and this intensity of heat limits the piston size quite definitely. It is noticeable that everyone who has studied the fighting aircraft in use to-day comes back impressed with the immense speed capability of the machines and their enormous power. At first the six-cylinder was able to take care of conditions, then, as more power was asked for, the eight V-motor came into favor, but this was only able to carry the power range a little farther than the six so it was followed rapidly by the twelve-cylinder and it is doubtful if even the latter can be made to give sufficient power for the planes about to be built. One suggestion which is perfectly practical is that of an eighteen-cylinder engine with three sets of six-cylinders arranged fanwise on a single crankcase with a single crankshaft. It is believed that some of these motors are being constructed in England and, theoretically, the only disadvantage appears to be the fact that such a construction will be rather wide. The desire to keep down the width has been largely experimental in developing the twelve-cylinder aviation engine as opposed to the eight. It is stated as a rule that the fuselage of a high speed plane should not be over 26 in. in width and it is none too easy to get even a 60-degree twelve-cylinder engine within that dimension.

Packard Co. Plans

It was with this information before us, and with a feeling that someone in this country should put in some real time developing aircraft motors (partly because we believe there may be some commercial future in it, but largely because we think this country may need some type of that motor) that the Packard Co. set out to develop a twelve-cylinder or rather, a couple of twelve-cylinder aviation motors. Of course, having settled the type of motor, it became important to consider the thousand and one details.

The first important detail that came up for discussion was the matter of propeller ratio. That is, whether the propeller should be mounted direct on the crankshaft, or geared down. Of course, if it is mounted direct on the crankshaft, the motor speed is limited to not over 1200 or 1400 r.p.m. In other words a load-carrying machine will run approximately 1200 r.p.m. at the propeller and, in the very heavy load-carrying machines, it is sometimes desirable to run the propeller as low as 900 r.p.m. So it seemed very desirable to gear down the propeller, but we knew that there were a lot of problems to be met in the geared down construction. While it has been experimented with to a considerable extent, there has been much trouble experienced. So far as that is concerned, the direct driven machine, with the propeller mounted on the crankshaft, is not free from trouble, by any means. Out of balance of the propeller is bound to exist, in spite of fine workmanship. This, coupled with the inequalities of the air through which the machine may be flying, put some very heavy stresses on the propeller and its mounting. A test that one of the foreign governments is putting on propellers now amounts to something like mounting a seven-pound weight 30 in. from the center of the propeller, and running the engine at its rated speed for some considerable length of time. That may not sound like much, but it will come pretty near walking off with the dynamometer base at 1400 r.p.m.

Propellers Break Crankshafts

The out of balance that exists in propellers is, I believe, responsible for crankshaft breakage on the direct-driven outfits. Many engineers have been working on aeroplane motors who know much more about that subject than I do, but they all agree that the crankshaft is one of the very weak links in aeroplane motor construction. I do not know whether they would agree with me that crankshaft breakage is very largely due to inequalities of balance of the propeller, or not, but nevertheless, I believe that has a very important bearing on it, judging by the way the crankshafts break.

It would seem, in going to the geared type, that we get away from some of the strains on the crankshaft due to the propeller, but of course we must put them somewhere else. A short lay shaft, which must be very rigidly mounted, on very heavy bearings (and those bearings must, of course, provide for radial load, and also for end thrust), seems the

best practice using very large self-aligning ball bearings at both ends of the short shaft, and mounting a very heavy double thrust bearing in between. This, of course, causes the use of very substantial gears, to gear down with, and provides ample means for cooling them with oil. I believe that with a properly designed outfit, an efficiency between 98 and 99 per cent can be obtained. This mounting must be very rigid, and I believe it is desirable to cast the crankcase and the case to carry the propeller mounting out of an alloy a little stronger than the ordinary aluminum.

Valve Location a Study

One of the next things that might be considered is the location of the valve. We, of course, know that we want the most power we can get, coupled with the best possible economy and reliability. Noise is not so much a factor, so that we naturally come to the valve-in-the-head. Of course, it is not absolutely necessary to use two overhead camshafts, but it seems desirable, as it does not necessarily add greatly to the weight of the motor, and it very greatly lightens the reciprocating valve parts. This is particularly desirable with the geared down type of motor, because it will probably be desirable to run the motor in the neighborhood of 1800 to 2200 r.p.m., and it must be remembered that, in an aeroplane, the motor is always running, when it is running, at its rated load. It is not like an automobile motor, that is working about one-tenth of its speed the greater part of the time; and some surprising things happen when you put a motor in an aeroplane.

The overhead camshaft is, of course, of very clean-cut construction, and allows a good clearance for the mounting of the carbureter and exhaust pipes. There are, of course, two general schemes in use for mounting carbureter and exhaust pipes. One is to put the two carbureters, one each on the outside, and mount the exhaust pipes in the center. The other is, of course, to mount the carbureters in the center, and the exhaust pipes on the outside. I think that individual mounting in the plane will determine the location of these accessories. It is a little cleaner-cut proposition to mount the carbureter in the center, as low as possible, with the manifold, and put the exhaust pipes on the outside. I believe this is particularly desirable, as the spark plugs should, in my estimation, be on the inside, where the oil will drip off from them, and it would be undesirable to have the exhaust on the inside and the spark plugs also, as more preignition might result.

Points in Cylinder Construction

The next point that might come up would be the cylinder design. There are a number of constructions that are fairly satisfactory. The straight cast iron cylinder can be made rather light, especially when you take into consideration that you can nowadays weld jackets onto the cast iron and make quite a light construction. We know that it is good and reliable, and it is probably as cheap as any construction which has been developed up to this time.

Of course, another construction is to use aluminum with steel liners, either casting the cylinder separately, and leaving the head integral with the cylinders, so that you have to take the cylinder off to take a valve out, or casting the main barrels of the cylinder integral with the crankcase, and pressing the liner in, and bolting the head on.

Then there is still the Mercedes construction, of steel cylinders made out of forgings, all properly machined up and welded together. In my opinion, the steel cylinder is the best possible answer, although it is the most expensive, and the hardest to make, and may require considerable experimental work before we find out how to do the job in this country as well as they do it in Germany.

Of the other two constructions, I believe that the aluminum cylinder is more apt to survive than the cast iron, on account of the weight.

Location of Accessories

One of the problems that comes up next is the location of the accessories, and what accessories we want to carry. We of course got in touch with many foreign engineers, as well as our American engineers, and consider carefully the various problems regarding equipment. Practically without exception, they all said that they wanted electric lighting and starting, if it could be put on so that it would operate successfully. They had had experience, however, with badly designed electric lighting and starting, and were more or less skeptical about the design, of course. However, the need for electric lighting and starting seems to be just as great as it was in the automobile, and even more so; because, if your motor stops up in the air, and if you are in a dangerous place, it would be very desirable to start it if you could. So that we are planning to try to get the best possible work out of the electric generator lighting and starting motors for turning the big motor over. You will understand, in coming to these big units, it is pretty hard to turn the motor over anyway, considering that there are twelve cylinders, 4 by 6.

Overcoming with Difficulty

It has already been announced in *The Automobile* that the Packard company is building a 900 cu. in. twelve-cylinder aviation engine and it may be interesting to show how the width of this large motor has been kept down. As stated earlier in this article, it is far from easy to get a large motor with the cylinders set at 60 deg. sufficiently narrow to be installed in a fuselage 26 in. wide. In order to overcome this trouble the big Packard engine will have the cylinders at 40 deg. The object of putting them at 60 deg. is, of course, to divide the impulses evenly. Both sides of the twelve-cylinder motor are in perfect natural balance, so a change in the angularity of the cylinder blocks will not affect the balance, although it will affect the impulse frequency.

Careful experimental work, however, reveals the fact that the very slight variation in impulse frequency due to setting the cylinders at 40 deg. cannot be detected above speeds of 400 to 500 r.p.m. Seeing that the aeroplane engine runs at a practically constant and much higher speed, this low speed variation is not important.

It has been found that building the large twelve-cylinder Packard engine with a 40-deg. angle saves approximately 7 in. on the width. It also saves a little weight and adds a little to the strength.

Expects Battery Ignition

As to ignition, the foreigners nearly all wanted magnetos, because they are not familiar with the present state of the generator ignition art in this country. I believe it is desirable to design an aeroplane motor so that either magnetos or the generator type of ignition can be used. It is my belief that as electric lighting and starting becomes popular, as I am sure it will, the generator type of ignition will go with it.

It is, of course, necessary to provide an accurate tachometer, which is driven off the camshaft, and also an air pump for providing either pressure or vacuum. There seems to be a growing tendency to use vacuum for the gasoline feed, on account of the possibility of holes being shot in the tanks, and releasing the pressure.

I will just very briefly run through two other points here: Lubrication is course pressure feed, and there are two general systems in use. One is to carry the oil in the sump, and the other is to pump it all out of the sump, and pump it through a radiator. I have not had enough experience to be able to make any prediction as to which is the better. A great many foreigners want two spark plugs in each cylinder, more for reliability than because it is necessary for power. The radiator location is a very important question. It makes the nicest looking job to locate it in front, but it does add somewhat to the head resistance, although if properly designed, and not over 26 in. wide, it makes a very good work out in a large motor. Of course, the other arrangement is to locate the radiators one on each side of the fuselage.

Weight Second to Reliability

My investigation showed that weight is secondary to reliability and economy. Just one word as to workmanship on aircraft motors. This sort of motor will, of course, have to carry with it workmanship that we could not possibly afford to put in an automobile, and it would not do any particular good if it were put in an automobile. In other words, it is absolutely impossible to put a gasket in an aeroplane motor in any place. You might possibly use it between the intake and the carbureter, but no place else. The constant weaving of the motor in the air seems to just naturally work the gaskets loose, and they blow out. In other words, every joint must be a lapped joint, so that they can be taken down any number of times without leaking, under any conditions.

S. A. E. EXPERTS WORKING ON AVIATION ENGINE

By Russell Huff, President Society of Automobile Engineers.

NOT so long ago the motor-car industry was a struggling infant and yet in a very short space of time it has grown to be a vigorous adult. The prosperity it has brought to this country, especially in periods of depression, has been enormous. Prior to its advent, which was accompanied by so much that was new in the mechanical world and by such rapid growth, the organizations within the control of our Government had no difficulty in keeping pace with engineering activities of all kinds. The army, the navy, the department of commerce and the many active Governmental bureaus could meet new engineering situations as fast as they arose.

But the development of the motor car, motor truck, tractor, submarine, high-speed motor boat, the hydroaeroplane, aeroplane, dirigible—all using the internal-combustion engine—has been so rapid as to require the closest alliance of the Government organization with the outside engineering world. The problems connected with the development of these types of apparatus are of a highly technical nature, while the multiplicity of accessories attached to their operation requires every sort of engineering activity. Moreover, the engineers and commercial men dealing with one device deal with all to a greater or less extent.

The members of the Society of Automobile Engineers move from one manufacturing activity to another and thus their industrial ramifications are endless. Builders of engines are of necessity familiar with and needed by all. The men who furnish iron, aluminum or brass deal alike with all. Those making carbureters, tanks, gauges and radiators similarly serve all of these industries, as do also the manufacturers of electric lamps, storage batteries and of ignition and starting devices. Rubber, fabrics combined with rubber in many forms, gaskets, tires and hose are continually and increasingly used by motor car and aeronautic engineers. The dirigible and motor boat will also draw heavily on the rubber and other industries mentioned.

The rapid advance in the design and construction of air, land and water transportation mediums, as exemplified by the aeroplane, automobile and motor boat, has naturally resulted in the formation of plans that permit complete co-operation in all engineering matters between Government and commercial activities. An evidence of this co-operation is the recent creation by Congress of the National Advisory Committee for Aeronautics. A long step forward is thus taken in the rapid development of the aeroplane and dirigible industry, a development now urgently demanded by popular sentiment in the United States and absolutely needed by our army and navy, if the aviation service is to be efficient in any modern sense. The committee is composed of representatives of the army, navy, Smithsonian Institution, United States Treasury, Bureau of Standards, United States Weather Bureau and of scientists who have taken a prominent part in the development of the aeroplane.

The members of this body represent the broadest selection of practical and scientific knowledge and are backed by unusual and wide Congressional authority. It has now taken the initiative and opened communication with the engineering and manufacturing world. A sub-committee on aviation motive power has been selected and authorized to act in conjunction with the Society of Automobile Engineers. It is understood that this sub-committee will include in its investigations the many accessories that are a part of the modern aviation engine and will take action at once to forward the adoption of uniform standards and specifications for its construction. The members of the sub-committee are Dr. S. W. Stratton of the Bureau of Standards, Lieut. Col. Squier, Aviation Division, Signal Corps, U. S. Army, and Capt. Bristol, U. S. Navy. These officials have selected as working assistants Dr. H. C. Dickinson, Bureau of Standards, Henry Souther, Past President of the Society of Automobile Engineers and now consulting engineer, Aviation Section, U. S. Army, and Lieut. Childs, U. S. Navy.

This combination of Government and S. A. E. strength should lead to results that will be based on the best knowledge obtainable from every source—scientific, engineering and commercial.

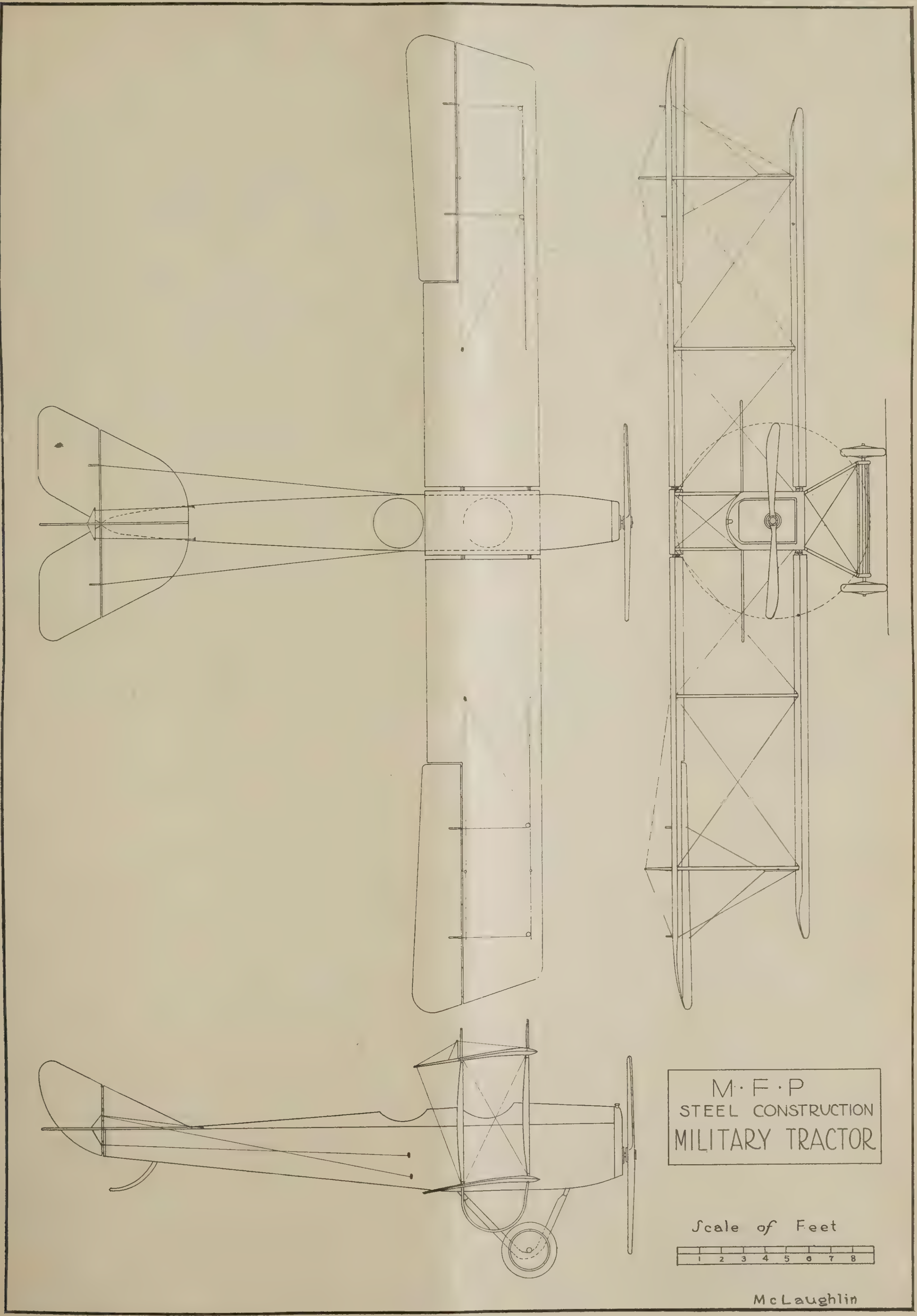
THE M. F. P. WARPLANE

THIS machine has been attracting attention at the Garden City field, New York City, having been brought here by the Polson Iron Works, of Toronto, Canada. A number of these machines were built for the British Government, through Canadian officials, to conform to the latest requirements of Government warplanes. A full description and a number of photographs were supplied by Mr. Walter H. Phipps, who designed the machine, and were published in the April 3rd issue of AERIAL AGE. The accompanying drawing gives a better idea of the lines of the machine than could be shown in a photograph.

Its great wing spread, 45 feet, is emphasized by the fact that there are no hangars at Garden City that can accommodate it except when the machine is turned at an angle and run in the hangar diagonally. A good deal of skillful manœuvring is required to take the machine out without it touching the side walls. Its size is not so apparent when it gets into the air, for the graceful way it handles compares well with many of the machines in which the safety factor has been cut down to obtain lightness.

Although steel tube construction forms the greater part of its makeup, the M. F. P. Company claims that this machine is considerably lighter than wooden machines of similar dimensions, and this assertion seems to be backed up by the many convincing demonstrations that have been going on at Garden City this summer.

Progressive builders have long recognized the possibilities of steel aeroplane construction, but in many cases other material is used principally on account of the lack of proper facilities for handling such work. The Polson Iron Works' experience in steel work as applied to other industries has successfully been adapted to producing this most approved form of modern aeroplane construction.


M·F·P
STEEL CONSTRUCTION
MILITARY TRACTOR
Scale of Feet
1 2 3 4 5 6 7 8
McLaughlin

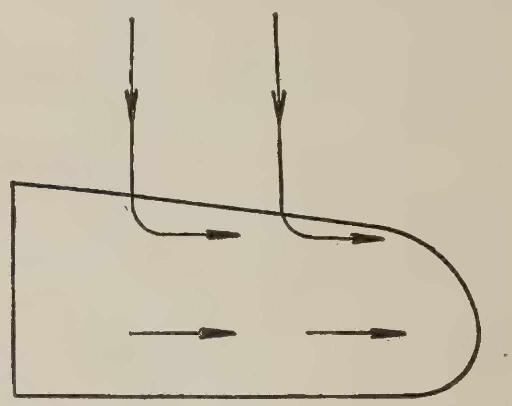
VARIABLY-CURVED PLANES

By W. L. M.*

(*Continued from page* 479)

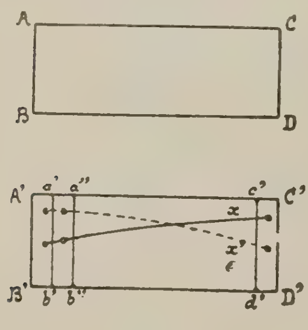
LATERAL STABILITY

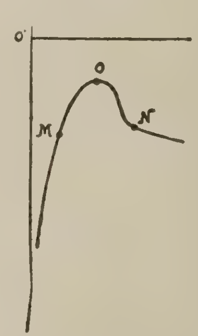
The laboratory tests have not, unfortunately, up to the present permitted of the study of lateral stability. It was necessary for this purpose to experiment in the open with models, either in free or towed flight. This method is not, of course, one of mathematical precision, but it does afford an opportunity of making interesting observations. One of the most remarkable qualities of these models is the rapidity with which they can be repaired after they have been badly damaged. Their flight path is very steady, and a complete



absence of lateral oscillation is noticeable compared with models of more usual form.

Fig. 8 is the projection of an aluminum surface which has given good results. On it I have simply indicated the three projections of the wing. The completed model has no tail plane. It behaved very well, but quite small modifications in curvature are sufficient to reduce the stability. As a result the duplication of the model is a very laborious process. The same difficulty has been found in the hulls of ships, particularly in the case of racing yachts, which frequently fail to give the results anticipated. From this point of view aluminum is invaluable, for it has a surface as smooth as





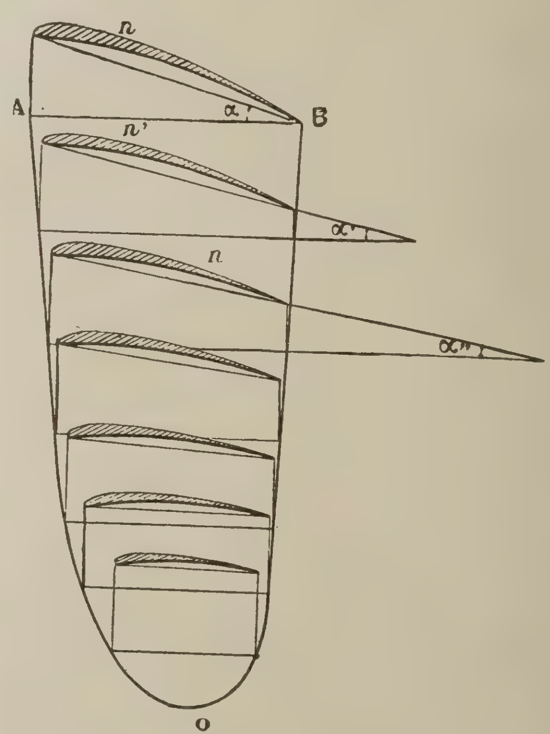
wood, and in addition possesses the advantage that it can be bent to any shape required, but is sufficiently stiff to preserve the form given to it. It appears that the curvature of the wing transverse to the chord plays an important part in directional stability. The greater the curvature the greater is the tendency of the model to yaw into the wind, so that when glides are made on a hillside in an ascending current very characteristic figures of 8 are obtained, as the model turns head to wind at each gust (Fig. 9). I have tested small models on the seashore in winds up to 20 meters per second (45 m.p.h.). They had to be considerably weighted to increase the gliding speed, and the wing curve had to be augmented to insure their turning into the wind. I have also noticed that the dihedral angle is of importance, and that generally speaking, the best results are obtained when the lowest point of the tips of the wings is on the same plane as, or a little higher than, the apex of the dihedral.

*Reprinted through Courtesy Aeronautics (London).

In carrying out tests over water I was compelled to give up towing models with ordinary cambered wings, as they always side-slipped as soon as they got off, but when using warped surfaces I have never had the slightest cause for uneasiness on this score.

I am convinced, too, that this form of wing would give excellent results in the event of side-slipping, which is so frequent an occurrence in full-sized machines. It is easy to understand that models suspended by one wing tip and allowed to follow their own course on release will right themselves much more quickly if of the warped wing type. In an ordinary model it is the tail plane which is the principal factor in recovering balance, whereas with warped systems the whole of the wing contributes to this end. It would appear that with this system a considerable improvement might be obtained by increasing the set-back of the leading edge. Such an arrangement undoubtedly assists longitudinal stability, but I have always found that lateral stability suffers in consequence. For instance, a model which I have tried with an exceptionally oblique entering edge, set back at 45°, was subject to considerable lateral oscillations and lacked directional stability, which seems paradoxical. To minimize these defects I had to increase the curve and so reduce the efficiency. It is dangerous, however, to generalize, for the possible combinations of curve, wing, form and slope of the entering edge are infinite.

I have tried to explain the lateral stability of my system by the well-known theory of the rolling axis suggested by Commandant Duchene. My design, like his, has an inverted dihedral angle, but while the latter form a Λ, mine have a shape of this nature, *M*. In my type some special phenomena must be produced since lowering or raising the c.g., so that the rolling axis makes a positive or negative angle with the trajectory of the c.g., makes no difference to the stability.



VARIOUS EXPERIMENTS

Instead of constructing a wing of which the angle of incidence diminishes from the center to the extremities, the experiment has been tried of adopting the converse and giving the wings greater incidence at the tips than at the root. By inclining the entering edge forward instead of backward a certain measure of stability is again obtained (Fig. 10).

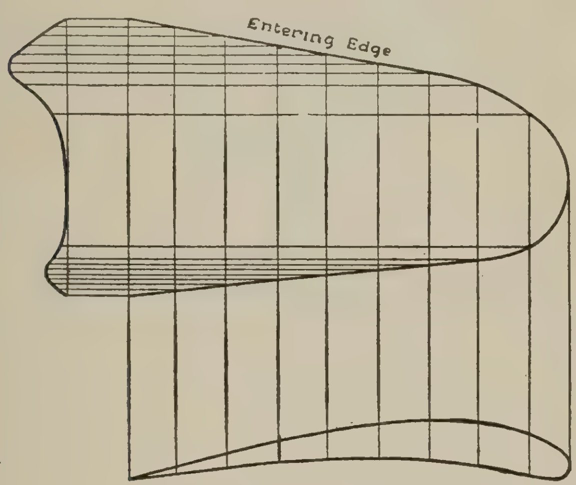
I constructed several models on this principle without any tail plane and found that they behaved satisfactorily, but with a considerably less degree of lateral stability than the others.

Also for a given weight and area their gliding angle was not so good and the speed was inferior.

No laboratory tests were carried out, but it would seem probable that on the top surface the air stream will follow an opposite course to that of the first set of models; that is to say, the direction will be centripetal instead of centrifugal.

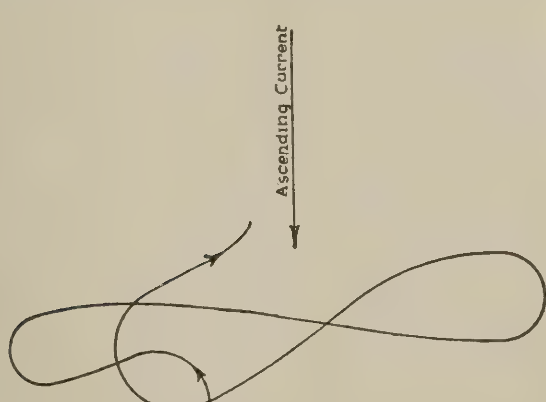
It will be noticed that the wing of the first type is analogous to those of seabirds which fly in heavy winds, while the second system bears a resemblance to vultures, which utilize light breezes and ascending currents. The stability of models of the latter type is improved by feathering the extremities of the wings and giving them a suitable twist.

To turn to tests made with flexible surfaces: On a boat sailing as close as possible to the wind a lateen sail heads



into the wind with a variation of incidence analogous to the warped surfaces we have been considering.

I built models in which each wing consisted of a sail with the mast forming the entering edge; changes of incidence were produced by the manipulation of a main sheet. These models maintained good balance and showed great lateral stability in towed flight. They gave interesting results when flown as kites.



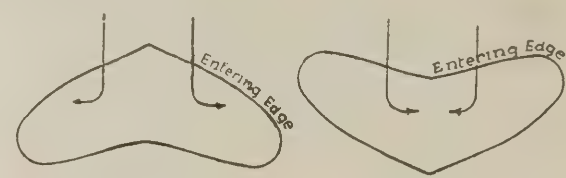
There are other wing forms which possess the quality of inherent longitudinal stability, such as the Arnoux double-cambered wings and the (Zanonia-leaf) type used on the Etrich monoplanes.

In this case it is the righting couples, taken in profile, which produce stability. The wing section has a reversed curve (Fig. 13), while in the case of warped wings the curve remains continuous. I have never succeeded in obtaining so good a gliding angle with this type as with the warped wing. They give good longitudinal stability, but their lateral stability is inferior in disturbed air.

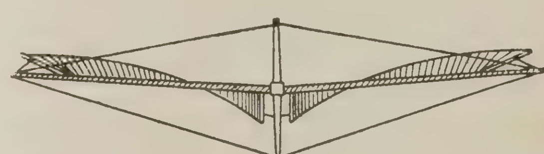
However, about 1903 Etrich and Weiss conducted experiments with tailless gliders of this type which are said to have obtained good results.

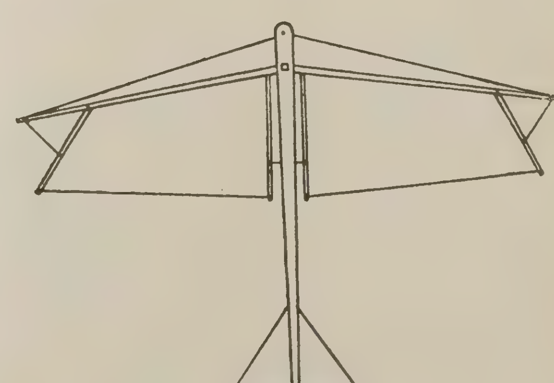
The Dunne Aeroplane

At the 1913 Salon a machine with warped wings was seen in France for the first time. It was the French-built Dunne aeroplane constructed by the Nieuport Company. Commandant Felix had flown to France on a similar machine, which was somewhat roughly constructed, but had proved its excellent flying qualities. The machine exhibited was a considerable improvement on the original in this respect. It was fitted with an 80 h.p. Gnome motor, and its wings were sufficiently swept back to obviate the need of a tail. Lateral balance and alterations in elevation were controlled by the flaps, *AA*, which worked differentially (Fig. 14). The curvature of the rear portion of the planes is that of an ordinary cambered wing, but the front is taken from a portion of the cone, *B*.



This has the constructional advantage of permitting the employment of straight longerons, but it gives less transverse curvature than a cylindrical surface, which is probably the reason for the provision of vertical panels at the ends to improve the directional stability. It would seem likely that, from the point of view of steadiness in wind, it would be better to discard these panels and increase the transverse curvature, although the machine appears to be remarkably steady. Its chief characteristic is its tendency to keep head to wind, contrary to the majority of modern machines, which

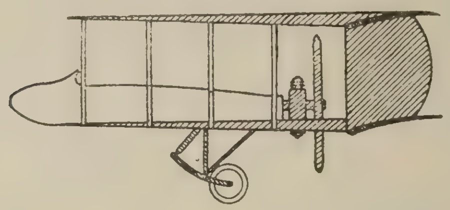


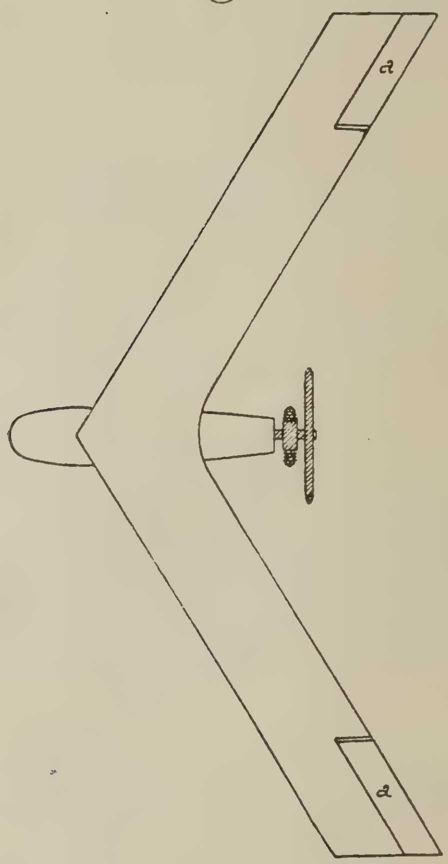


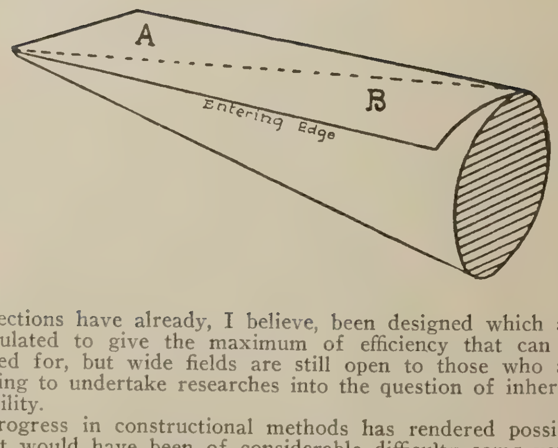
tend to yaw away down wind. The vertical panels probably assist this tendency.

Another machine, the Moreau Aerostable, has, I believe, made the bulk of its flights with warped wings, and the stability of the type may be due in some measure to this; but the example shown at the Salon was fitted with wings of ordinary curvature.

It is interesting to notice that constructors are beginning to take up the question of these surfaces, in connection with which practically everything still remains to be done.







Sections have already, I believe, been designed which are calculated to give the maximum of efficiency that can be hoped for, but wide fields are still open to those who are willing to undertake researches into the question of inherent stability.

Progress in constructional methods has rendered possible what would have been of considerable difficulty some years ago, and there is no doubt that we shall soon see a great increase in the number of experimenters on these lines.

New Haven to Bay Shore by Flying Boat

Harry Witts and Archie Crost, two recent graduates of the Curtiss school, flew from New Haven to Bay Shore on July 7. They traveled about one hundred miles and made the trip in one hundred and thirty-five minutes, at one time reaching an altitude of 8,000 feet.

The aviators brought a letter from a friend in New Haven to Miss Henrietta Knapp, a summer resident, and also a copy of the New Haven *Journal-Courier*, which they presented to Irving J. Long, editor of the Bay Shore *Journal*.

Thomas F. Ryan Offers Estate as Aviation Training Field

Thomas F. Ryan, the New York financier, has offered several hundred acres of his big estate near Charlottesville, Va., to the Government to be used as a remount depot, for aviation field or stock raising for the army. If the offer is accepted a nominal sum must be paid for it to conform to the law.

A board composed of army officers appointed by Secretary Baker recently visited the grounds, and has submitted a report to Major Gen. Scott, Chief of Staff, which is understood to recommend acceptance.

Asheville Fund for Aeroplane

Asheville will inaugurate this week a movement to raise funds for the purchase of a regulation army aeroplane to be presented to the North Carolina National Guard. The plans include the raising of a regulation aviation company, consisting of two aviators and the regulation number of mechanics and attendants. Asheville has two licensed aviators in Steve McEniry and Henry Crowell, both of whom have licenses from the Aero Club of America, and both of whom are anxious to serve at the front. Mr. McEniry has already proffered his services to Governor Craig and to the government. Governor Craig was forced to decline for the reason that North Carolina has no aviation equipment.

According to present plans, Asheville will raise the necessary money, buy a regulation military tractor of the latest improved type, which will be named "The Asheville," will man it with an efficient force, and turn it over to the State of North Carolina, to be used with the North Carolina National Guard.

Export of Aeroplanes

In the week beginning July 2nd, the following export of aeroplanes and parts were made: to Panama, $3; to France, $150; to Brazil, $20,000; total $20,153.

Home Defense Aviation Corps for New Jersey

New Jersey is shortly to have an aero squad for home defense service if plans of several leading citizens of Short Hills and Morristown materialize. The project is backed by Assistant Secretary of the Navy Franklin Roosevelt, and a meeting for organization will be held in the Newark Young Men's Christian Association Building in the near future.

Plans for the organization of an aero corps were only formulated last week, the prime movers in the project being patriotic men who, because of family and business cares, are unable to enlist for service in the volunteer army which will probably be sent to Mexico.

Lieutenant William J. Moses, who is in charge of the naval recruiting office at 86 Park place, this city, is one of the men actively interested in the movement, and Clarence Martin, of Short Hills, who is a real estate broker in New York, is another of the prime movers.

"As you probably know," said Mr. Martin, in discussing his plans yesterday, "New Jersey is what is called the Third Naval District, which extends from New London to Barnegat. Alan Hawley, president of the Aero Club of America, has promised to back our movement, and we are planning to establish at least four or five stations in the district. We will probably have two stations on the New Jersey coast, one on the northern shore of Long Island, another on the southern shore and still another at some advantageous point.

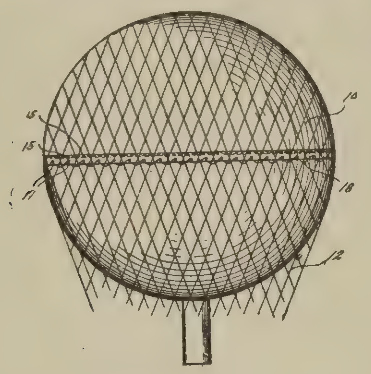
"Assistant Secretary Roosevelt's idea is to get the government to allow the use of aviators for several of these stations and to teach men to fly. We also expect to secure appropriations from the national government and the various states for the work. The home coast defense organization could enlist in time of war or not, as seems wise."

The First Battalion New Jersey Naval Reserves already has an aviation corps in the making. At a conference between Commander Edward McClure Peters, of the Reserves, and a number of veteran former members of the battalion held in Newark last Thursday night, ways and mean for the development of the Naval Reserve Flying Corps were considered. It is possible some effort to combine, to an extent at least, these two movements may be proposed in the near future.

RECENT AERO PATENTS

BY WILLIAM N. MOORE

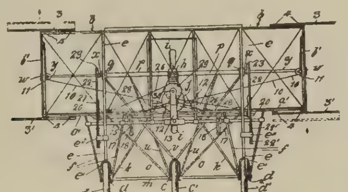
1,183,796. PARACHUTING ATTACHMENT FOR BALLOONS. George L. Bumbaugh, Indianapolis, Ind., assigner of one-half to Albert L. Watters, Indianapolis, Ind. Filed Oct. 5, 1914, Serial No. 865,032. Renewed Oct. 8, 1915. Serial No. 54,888. (Cl. 244—3.)



1. In a balloon, the combination of a gas bag, a fabric reinforcing strip fastened around the equator thereof, said reinforcing strip being free at one edge and providid with eyelets, a netting fitting over the gas bag, and a cord for lacing the netting to the reinforcing strip and passing through the eyelets thereof.

2. In a balloon, the combination of the gas bag, a fabric reinforcing strip fastened around the equator thereof and in itself furnishing the sole reinforcement of the gas bag, a netting fitting over said gas bag, and means for attaching said netting directly to said reinforcing strip.

1,183,435. FLYING-MACHINE. Dominick Citro, New York, N. Y. Filed Aug. 20, 1913. Serial No. 785,607. (Cl. 244—29.)



1. A biplane having at each of its sides and outside the planes a pair of ailerons mounted one above the other and free to swing; and means for simultaneously throwing away from the planes the upper aileron on one side and the lower aileron on the opposite side independently of the other two ailerons.

2. A biplane having at each of its sides a pair of spring-controlled hinged ailerons spring-held normally against the outside of the planes; and means for simultaneously throwing one aileron of each pair away from the planes.

3. An aeroplane having spring-controlled ailerons spring-held normally against the outside of the planes; and means for moving the same into operative position about an axis extending substantially lengthwise of the aeroplane.

4. An aeroplane having hinged ailerons normally spring-pressed against the outside of the planes; and means for moving the same into operative position about an axis extending substantially lengthwise of the aeroplane.

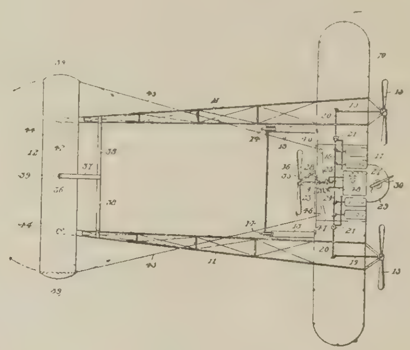
5. An aeroplane having spring-controlled hinged ailerons spring-held normally against the outside of the planes; and means for moving the same into operative position about an axis extending substantially lengthwise of the aeroplane.

1,182,317. AEROPLANE. Frank Rogala, Detroit, Mich. Filed Dec. 27, 1915. Serial No. 68,856. (Cl. 244—29.)

1. An aeroplane comprising a forward biplane, rearwardly extending tapered parallel skeleton frames carried by the said biplane, a steering biplane centrally pivoted adjacent the rear ends of the said skeleton frames, anti-friction supporting guides means for the said steering plane upon the rear ends of the said frames and shifting means for the said steering plane operable within the said forward plane.

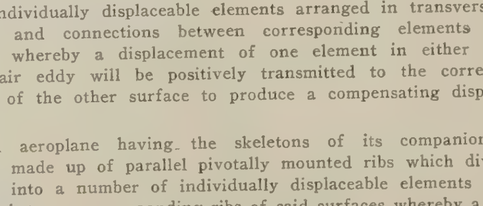
2. A device of the class described comprising a main forward biplane, motor driven controllable operating propellers carried by the said plane, an adjustably tiltable elevating means upon the carried by the said plane, and a steering biplane pivotally mounted at the rear of the said frames.

3. A device of the class described comprising a main forward biplane, motor driven controllable operating propellers carried by the said main frame, an adjustable tiltable elevating means upon the said



forward plane, rearwardly extending parallel skeleton frames carried by the said plane, a transverse bracket connecting the said frames adjacent the rear ends thereof, a rearwardly U-shaped member centrally arranged between the said frames upon the said bracket, a steering biplane centrally pivoted in the said U-shaped member with the free ends of the said skeleton frames arranged between the top and bottom thereof, parallel arms carried by said free ends of the skeleton frames, arcuate guides upon the inner faces of the top and bottom members of the said steering plane, pairs of anti-friction rollers journaled in the free ends of the said frame carried arms operatively positioned within the said guides and controlling cords attached to the opposite ends of the said steering plane and extending inwardly of the said main frame.

1,177,431. AERIAL MACHINE. Jean Gabriel Joseph Meugniot and Andre Charles Marie Meugniot, Arc-les-Gray, France. Filed Nov. 27, 1911. Serial No. 662,758. (Cl. 244—29.)



1. An aeroplane having each of its companion acting surfaces made up of individually displaceable elements arranged in transverse juxtaposition and connections between corresponding elements of said surfaces whereby a displacement of one element in either direction by an air eddy will be positively transmitted to the corresponding element of the other surface to produce a compensating displacement thereof.

2. An aeroplane having the skeletons of its companion acting surfaces made up of parallel pivotally mounted ribs which divide said surfaces into a number of individually displaceable elements and connections between corresponding ribs of said surfaces whereby a displacement of one element in either direction by an air eddy will be positively transmitted to the corresponding element of the other surface to produce a compensating displacement thereof.

3. An aeroplane having the skeleton of its companion acting surfaces made up of parallel pivotally mounted ribs which divide said surfaces into a number of individually displaceable elements and connections between corresponding ribs of said surfaces whereby a displacement of one element by an air eddy will produce a compensating displacement of the corresponding element of the other surface, the connections including upper and lower cables, and means for guiding said cables.

FOREIGN NEWS

FRANCE

On July 4th a squadron of French aeroplanes visited Sofia and dropped bombs on the military buildings there. No damage was done, according to a dispatch from Sofia.

The following is the official report of the French War Office for June 2nd:

On the north Verdun front there has been no infantry action. A very vigorous bombardment has been maintained in the region of Hill 304 and in the Fleury and Damloup sectors. We have set on fire three captive balloons in the Verdun region.

Sergt. Chainat has brought down his fifth German aeroplane, which crashed to earth near Peronne on the night of the 1st. One of our air squadrons dropped forty-eight shells on the railroad station at Longuyon and eight on the station at Thionville. Another squadron dropped thirty-three bombs on the station at Brieulles. Our aviators bombarded today the railroad stations at Anagne and Luoquy in the Ardennes. Sixty bombs struck buildings and railroads and a train was destroyed.

The Germans have dropped bombs of very large size in the neighborhood of Nancy and others near Belfort. An enemy air squadron hurled several bombs on the open town of Luneville. This is noted in view of reprisals.

The following is the official night report for France for July 4th: "On the night of July 3 our aviators bombarded the railroad station at Longuyon (north of Verdun) and the barracks at Challerange (Argonne) and Savigny, and military establishments at Laon."

The day report is as follows:

"Our aeroplanes successfully attacked yesterday the important railway centres at Comines, Combles and St. Quentin. Our offensive patrols, working far into the enemy's country, encountered hostile aeroplanes in great numbers and much fighting took place. Four German machines were brought down inside our lines and at least three others were driven to the ground in a damaged condition. We suffered no further losses beyond those already reported."

Premier Briand was the principal guest at the Fourth of July banquet given by the American Chamber of Commerce. In offering a toast to the United States and President Wilson the Premier said:

"The Sons of the American Revolution, thrilled to the depth of their souls, feel instinctively that the present conflict is the last and most terrible convulsion of the age-long struggle between liberty and tyranny. They know that the Allies look forward to the dazzling promise of the full emancipation of humanity and the absolute respect of national aspirations and desires. They are writing in their blood the charter that shall free the world.

"I cannot forget that your volunteers are associated with our soldiers and that daring aviators like the heroic Chapman, living symbols of American idealism, have carried the love of our cause to the extent of giving their lives for it."

A Chapman memorial service at the American church was attended by members of the American colony, including officials of the embassy and consulate staffs and by three of Corporal Victor Chapman's countrymen in the Franco-American squadron, Lieut. William K. Thaw of Pittsburgh; Sergt. Elliot C. Cowdin, of New York, and Sergt. Norman Prince of Boston, with Capt. Thenault, a French officer of the squadron.

Many members of the American colony took part in the ceremony at the tomb of Lafayette, which was conducted by the Empire State Chapter of the Sons of the American Revolution.

On July 7th the open town of Lure was bombarded by a German air squadron with the result that eleven women and children were wounded and killed. The French War Office announced that the French reprisal would come later. Lure is a town of 6,000 inhabitants lying west of Belfort and near the German lines in Upper Alsace.

On July 6th a French bombing squadron dropped forty shells on the Ham-les-Moines railway and junction west of Charleville. Returning to the French lines, the French war planes escorting the bombing squadron brought down two German planes near Meceires and the Lessincourt Wood.

A committee of the Franco-American Flying Corps has decided to present money prizes to members of the corps upon whom war decorations have been conferred. Five hundred francs will be given for the Cross of War, 1,000 francs for the Military Medal and 1,500 francs for the Legion of Honor.

Mrs. William K. Vanderbilt attended the meeting of the committee.

The strenuous activity of their aerial bombers at significant points behind the German front, and the renewed thunder of their heavy batteries directed against the German third line defenses from emplacements considerably in advance of their original artillery positions, is evidence that the French have not yet finished with the Germans on the Somme.

The long-range guns dropping destruction into the German cantonments many miles behind the firing line have been ably assisted by the airmen, who as a result of bomb-dropping excursions against Ham-les-Moines, the most important junction of the railroads serving the Somme sector from the northeast, have forced the Germans entirely to rebuild the roadbed.

As Ham-les-Moines is only about eight miles from the Great General Staff's headquarters at Charleville, where the Kaiser is said to be stopping, the aircraft raids are believed to have created moral as well as material havoc. A good sized covey of Fokkers and Aviatiks guarding Charleville arose to attack the French battleplanes convoying the bigger bombing machines, and thereby lost at least two of their number without damaging the French squadron.

GERMANY

The official report for June 2nd follows:

"The enemy's aerial service displayed great activity. Our squadrons gave battle at various points and inflicted upon him heavy losses. For instance, in the region of the front attacked (the Somme) and that of the Meuse fifteen enemy aeroplanes were shot down, eight English and three French machines falling within our lines. Lieut. Baron von Althaus put out of action his seventh opponent. We lost no aeroplanes, but some pilots or observers were wounded."

The German official report for July 7th is as follows:

"East of the Meuse French attacks delivered on a wide front against our positions on the Froide Terre ridge and on the woods southwest of Fort Vaux failed, with considerable losses to the enemy.

"Southwest of Valenciennes we captured a French aeroplane. Near Peronne and southwest of Rouziere enemy aeroplanes were forced to land in an aerial battle.

"As the result of aerial battles during June, the German losses in such battles were two aeroplanes; shot down from earth, one aeroplane; missing, four aeroplanes; total, seven aeroplanes.

"The French and British lost in aerial battles twenty-three aeroplanes; shot down from earth, ten aeroplanes; involuntary landings within our lines, three aeroplanes; landings for the purpose of dropping spies, one aeroplane; total, thirty-seven aeroplanes, twenty-two of which are in our possession."

GREAT BRITAIN

The following is the official report of Great Britain for June 3rd:

"Yesterday our aeroplanes were very active in co-operation with our attack north of the Somme and afforded valuable assistance to our operations. Numerous enemy headquarters and railway centres were attacked with bombs.

"In one of these raids our escorting aeroplanes were attacked by twenty Fokkers, which were driven off. Two enemy machines were seen to crash to earth and were destroyed.

"Some long distance reconnaissances were carried out in spite of numerous attempts by enemy machines to frustrate the enterprises. Three of our aeroplanes are missing. Our kite balloons were in the air the whole day.

"On July 4th, Major Baird, representative of the Aerial Committee of the House of Commons, said that the demand for flying machines at the front was enormous. Recently as many as twenty-four flew across to the field of operations in one day, he added, in illustration of this demand and the manner in which it was being met.

The B. E. built, at the Royal Aircraft factory. It is stated that this machine has a remarkable degree of inherent stability.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
47 Churchill St., Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

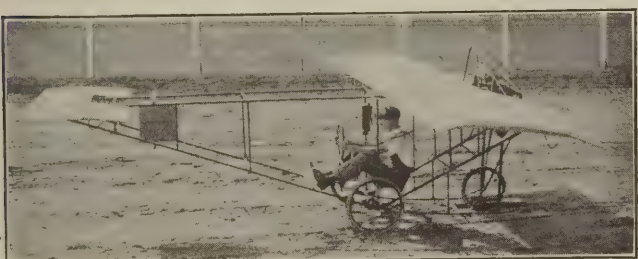
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The White Canard Type Monoplane

During the past few years considerable interest has been manifested in the development of small low powered machines. Perhaps one of the most interesting types of small machines yet to be developed in America is the Baby White Monoplane designed and constructed by Mr. George D. White, of Los Angeles, Cal. This machine is one of the smallest and lowest powered aeroplanes in the world. It is of the tail first or canard type, with all controlling planes in front and the motor in the rear.

It is interesting to note that the design of this machine is similar to that of the A type model.

The White monoplane is powered with an ordinary stock motorcycle engine which drives a 5-foot 3-inch propeller 1,500 r.p.m., and gives an approximate speed of 50 miles an hour in the air. The machine was not intended for any extraordinary flights, but is the forerunner of several refined models of White aeroplanes, with larger motors and corresponding higher speed and superior flying ability, which will shortly be placed upon the market.



General Dimensions

Span, 18 feet; length, 16 feet; chord, 5 feet; area main planes, 90 square feet; stabilizer span, 8 feet; area of elevators, 12 square feet; area of rudder, 4 square feet; weight complete, 230 pounds; lift per square foot of surface when loaded, 4½ pounds.

Main Planes

The main supporting surface is constructed in two sections or wings, each exactly 9 feet in [illegible] chord. The sections are built entirely of silver spruce of two main beams and 8 secondary beams with solid web type ribs 18 inches apart and battens or false ribs 9 inches apart with short ribs 34 inches long over the nose, 4½ inches apart to retain the efficient curve. Though rather unusual in monoplane practice, the wings have square ends and have 4½ feet of the trailing edge cut away where the ailerons are hinged. Each section is internally wire braced and coated with a moisture proof solution before being covered. Each wing, covered and with the aileron attached, weighs 17 pounds.

Fuselage

The fuselage is 16 feet long and of uniform width the entire length. It is constructed of 6 main spruce members and strutted and cross braced in the usual manner. The two lower longitudinals are laminated with hickory in the rear and bent up to form light skids, while two other members are fitted to continue the rear of the fuselage. The pilots seat is located just under the entering edge of the main planes, and owing to its low position, the fuselage is not enclosed. The two-cylinder V type motor is located at the extreme rear of the fuselage with the fuel tank just above. The oil tank is fitted with a force pump at the pilot's seat.

Landing Gear

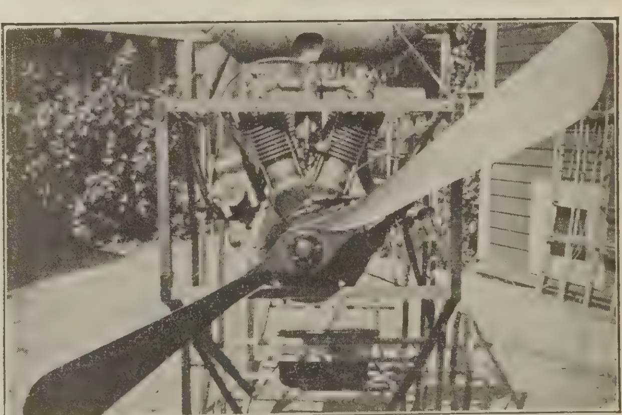
The landing gear consists of three 20-inch wheels, two being attached direct to the bottom of the fuselage with the aid of rubber shock absorbers, and the other located midway between the skids beneath the motor in the rear. The skids are steel shod and, though small in size, have proven themselves invaluable in taking the load without breakage when the rear wheel collapses in a rough landing.

Controls

The method of control is of the semi-Deperdussin type, with ailerons operated with a sidewise movement of the steering wheel and the elevators operated by a fore and aft movement. The rudder is operated by a pivoted foot bar. The elavators consist of hinged extensions to the rear of the stabilizer which is located at the extreme front of the fuselage. The rudder is located just behind the elevators in the center of the fuselage. The motor controls are on a quadrant at the left of the pilot.

General

All wire bracing is with Roebling cable and plated wire, and the wing covering is No. 6A Naiad. The motor has been tested both direct to the crankshaft and with gear reduction. When geared, the motor runs at double the speed and develops more power, but a per cent of the increased power is lost in the chain transmission. Propellers ranging in size from 4 feet to 5 feet 6 inches have been used, but the 5 foot 3 inch by 4 foot 9 inch is apparently the correct size. The monoplane was first assembled and tested at Ascot Speedway in Los Angeles, where on the second attempt the machine left the ground quite easily, but was later slightly wrecked by colliding with the rail fence which surrounds the track. When the repairs were completed the machine was taken to Dominguez Aviation Field and later to a private field of 45 acres inside the city limits of Los Angeles, where all later flights were made and where the machine is now located.



Rear view of the fuselage of the Baby White monoplane showing the ordinary stock motorcycle engine propeller and gasoline tank. This engine is capable of driving a 5′ 3″ propeller 1,500 R. P. M.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials cf contributor will be printed when requested.

Answers to Technical Queries

Dear Editor—Will you kindly advise me of the method to follow to come down when my engine stops while at a great height.

Answer—No method needed; you will come down without any effort on your part.

Dear Editor—I have recently perfected a combination aeroplane and submarine. Could you tell me where I could find some one interested in such an apparatus?

Answer—Drop in at the nearest insane asylum; they have been waiting for you a long time.

Dear Editor—When I start the propeller on my aeroplane the machine goes the wrong way. What shall I do?

Answer—Turn your seat around and drive the machine backward.

Dear Editor—When my mechanician turns the propeller over, the engine does not work. What shall I do?

Answer—Try putting a little gasoline in the tank.

Dear Editor—Many times as I am ready to start for a flight I find that my engine is missing. What shall I do?

Answer—(Refer to the Lost and Found Department.)

Dear Editor—I find that I lack the courage to fly, yet I am very ambitious. What is the remedy for this?

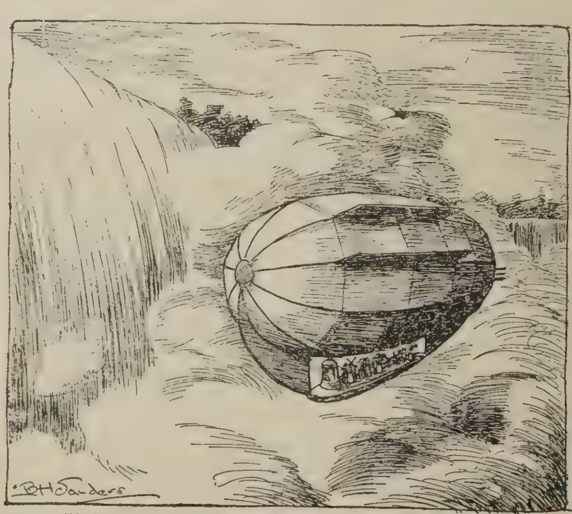
Answer—Courage can be procured at twenty-five cents a flask at any good saloon. (Yes, thank you, we do.)

Dear Editor—I have just finished building a new aeroplane but do not know how to disassemble it.

Answer—Show it to someone who knows a *good* machine when he sees it. He will pull it apart.

Dear Editor—I find that my aeroplane does not rise easily. How can I remedy this fault?

Answer—Put a little yeast in the gasoline. If this does no good try dynamite. (Is your will made?)



THE UP-TO-DATE MAID OF THE MIST.

Passenger—"Time must hang heavy on your hands."

Pilot—"Why honey?"

Passenger (recklessly)—"Well, you wear a wrist watch."—*Jester.*

Fire in His Eye

Zeke—I ran all the way to the fire at the aviation field last night.

Reek—Did you save anything?

Zeke—Yeah; carfare.

(And now they scarcely speak.)

Interested Friend (to aeronautical writer)—Writing stories, eh? Why don't you try writing for the *Saturday Evening Post?*

Writer—The circulation is too big. I could never write two million copies of my story.

Keep your eye on the du Pont boom. It'll be some Zeppelin before the convention gets down to business.—*The Hon. Ormbsy McHarg.*

"Some Zeppelin" is an unfortunate metaphor. The name du Pont is synonymous with powder, and Zeppelins drop bombs on munition plants.

Pittsburgh, says Dr. Walther Riddle, is entitled to be known as the birthplace of aviation. Somebody should invent a Pittsburgmillionaeroplane.—*Life.*

At the Aviators' Hotel

Fancy—"This breakfast food looks like saw dust."

Full—"Yes, it's fine board we get here."

Indignant Waiter—"Pardon sir, but this coin you gave me is bad."

Departing Diner—"Did you ever stop to think about your service?"

Poor Stock for Investment

The stock of balloons is going up,
The makers are elated;
But don't you put a cent in them—
The darn things are inflated!

Rather Dense

"And when you fly over Pittsburgh you carry a broom to sweep the smoke away?" interrogated the admirer.

"Sure thing!" laughed the aviator.

"Do you carry a broom when you fly over London?"

"No; I carry an axe."

Proposed Regulations for Aeronauts

1. An operator, before abandoning car in case of wreck, shall hang out a red light and whistle three times.
2. Before dropping out bags of ballast, operator shall sterilize same, as protection for pedestrians below.
3. Always turn to the Wright, saluting.
4. Ships of a thousand bird power and over shall be painted canary yellow.
5. Drivers running past toll stations shall be subject to double fine.
6. If operator discovers hobo beating his way on the bumpers, he shall eject same at next regular station. It shall be unlawful to evict him in midair.
7. All passenger schedules shall be open to the inter-air commerce commission.
8. All airships must be equipped with airbrakes.

New Aviators for Mexican Border

Four junior military aviators who recently qualified at the signal corps training school at San Diego and who were assigned to duty with the first aero squadron on the Mexican border, will leave in the next few days. Lieutenant Carl Spatz will go to Columbus, N. M. He will be followed early next week by Lieutenants B. M. Atkinson, J. B. Brooks and H. S. Martin.

Captain H. G. Arnold, pioneer army aviator, arrived from Plattsburg barracks, New York, to assume the duties of property officer at the North Island school. Lieutenant Byron Q. Jones, who will take charge of the motor department of the establishment, is expected to-morrow from Boston. Lieutenant Herbert Dargue, who has been on duty with the first aero squadron in Mexico, is due to relieve Oscar Brindley as chief flying instructor.

Personal Pars

W. W. Spain, South Dakota's first national guard aviator, who was detailed May 1 by Adjutant General Morris as the one officer from his State to take the eight weeks' course of training at the Curtiss Aviation School at Newport News, Va., has reported for duty there. Mr. Spain is senior first lieutenant of the South Dakota National Guard, which he joined in 1903. He is credited with having organized the first signal corps in the State under Adjutant General C. H. Englesby of Watertown.

Ire S. McCoy, of Clifton, Va., is making daily balloon ascensions at the River View Park, Baltimore.

The daily dirigible flights of A. Leo Stevens at Palisades Park are attracting much attention at that place of amusement, and also among the New York City residents directly opposite the park.

David McCulloch has returned to America from Tarento, Italy, where he has been in charge of the Italian government's flying school.

Burgess News

Builder's tests of the seaplane built for Howard S. Borden, of New York and Oceanic, New Jersey, have been completed by the Burgess Company to-day, and the machine will be shipped immediately.

Although the aeroplane is the private property of Mr. Borden, its use will be offered to the Naval Militia of the State of New Jersey. The type is identical with that recently turned out by the company for the Naval Militia of New York. It was especially designed by W. Starling Burgess for the use of the militia organizations of the various states. It is especially adapted to training purposes from the fact that it is self-balancing, and the aviator's entire task in the air consists simply of steering and manipulating the engine controls.

It is built on the so-called Dunne system for which the Burgess Company has exclusive rights in America, and its inherent stability is secured through the form and disposition of the supporting surfaces themselves, and not through any auxiliary attachment.

Accommodations for pilot and passenger seated tandem are contained in the central body, in the rear of which is mounted a Curtiss 110 horsepower motor. Behind this is the radiator, stream lined with the body, just reversing the practice in automobiles.

With this power the maximum speed was found in the tests here to be just under 70 miles an hour, while the minimum speed is under 40 miles an hour, thus simplifying very greatly the problem of alighting. The rate of climb is 300 feet a minute, which is considered remarkable for a machine designed for over water use.

Recent tests have also been made with a Burgess-Dunne flying boat and have demonstrated the suitability of this type for the use of sportsmen. The hull of this craft is very similar to that used in Curtiss flying boats. In it are accommodated pilot and passenger seated side by side, and oil and fuel supplies for the motor. This type of construction gives much better shelter for the occupants of the machine, not only in the air, but on the water as well, while the problem of instruction is greatly simplified by the arrangement of the seats side by side.

Bonney with the General Aeroplane Co.

W. L. Bonney, formerly one of the pilots, is now chief instructor at the flying school of the General Aeroplane Co., Detroit, Mich.

This company has offered to train one Naval Militia officer of the Naval Militia on their flying boat and as soon as convenient they will also train one of the Michigan National Guards. The officers of the Company are as follows: Herbert V. Book, president; W. Howie Muir, vice-president; Corwin Van Husan, secretary and treasurer; Alfred V. Verville, general superintendent.

The hangars of the company are located at the Old Detroit Motor Boat Club.

Sportsmen to Organize Aviation School

There is a proposed aviation school under consideration at Muskegon, Mich., for some young sportsman of Grand Rapids. Great enthusiasm prevails in aviation matters in the district and it is expected that the organization will be completed in a very short time.

Atwood Tests New Machine

Harry N. Atwood made his first real test flight with his new machine at Williamsport, and hundreds of interested spectators watched the aviator as he skimmed over the river, "climbed" into the air, skirted under bridges and flew over the tops of the Market street and Maynard street bridges. Atwood stated after the flight that his hydroplane is now running smoothly and he had no trouble with the motor or propellers. Atwood's first flight is of considerable interest to local people, especially those interested in the Atwood Aeronautic Company.

Personal Pars

Mr. Lester Miller is the head of the new Miller Aeroplane Co., of Dallas, Texas.

Mr. J. S. Cosden, of Tulsa, Oklahoma, by contributing $500, started a fund on June 23 which it is hoped will result in providing the National Guard of Oklahoma with an aeroplane.

Dario Resta and Jean Domenjos have been making an extraordinary successful exhibition trip in the Middle West. In Cleveland a bomb dropping competition between Domenjos and Baxter Adams evinced great interest.

Miss Marie A. Peary, daughter of Admiral and Mrs. Robert E. Peary, is studying aviation at the Peary home on the Maine coast.

Farnham Fish, the well-known aviator, is touring the New England States.

Earl S. Daugherty, who flew a Stupar tractor constructed by the Chicago Aero Works last season, has accepted a position as instructor in the Signal Corps Aviation School at North Island.

A. Leo Stevens, of New York, on June 13 made a balloon flight from Aero Park, Pittsfield, Mass., and landed in East Hartland, Conn., a distance of 78 miles. He made the flight in a time of about three hours. He reported reaching an altitude of 25,000 feet. He carried a passenger who made a parachute jump from a height of 2,100 feet.

Minnesota's first recruit in the army aviation corps is Nicholas B. Mamer, of Hastings, Minn. He has passed all the usual preliminary examinations and will proceed at once to San Diego to receive final instructions at the army aviation school. Mr. Mamer is well known to visitors to the various county fairs, where he has performed many daring feats in motorcycle races and parachute jumps.

First Lieutenant Lewis E. Goodier, Jr., Coast Artillery Corps, has been retired and promoted to a captaincy. He was retired because of physical disability due to a fall from an army aeroplane.

Lieut. Phil Rader, who recently returned from England, will instruct the ten Harvard students at Buffalo.

Louis Gertson, the well-known Curtiss exhibitor flyer, looped twenty-five consecutive times at Chicago on the 25th of June, using his new Gyro 90-hp. tractor. His last three loops were done at 500 feet. Gertson leaves on his exhibition tour immediately.

Tom Gunn, Chinese aviator at San Francisco and Lilly Tong, his aviation school mate declared that San Francisco is to form an aviation school in China.

Mr. E. M. Post, Jr., of Tuxedo Park, N. Y., has enlisted in the aviation corps U. S A, and is now at Buffalo receiving his finishing course.

Goodyear Aeroplane Tires

"Now that increased attention is being given to the employment of aeroplanes as aids in national defense, it is interesting to note the part that Goodyear tires play in their use," says E. R. Preston, of the Goodyear Tire & Rubber Co.'s aeronautic department. "Aeroplane motors, like automobile motors, must be protected from jolts by pneumatic tires. In the earlier days all sorts of makeshifts were used; even bicycle tires were pressed into service on some of the pioneer machines. Some builders went so far as to use full size automobile tires. These were equal to the occasion as far as reducing the shock of landing was concerned, but were far too heavy and offered too much wind resistance.

"Developments in the science of building better aeroplane tires have been rapid and revolutionary. As machines have improved and developed higher speeds in the air with a consequent increase in the speed of starting and landing, Goodyear tires have kept pace.

"The old type of aeroplane tire was costly and uncertain. Present day necessity has compelled tire dependability, as machines are now larger and heavier and must carry more passengers and heavier loads.

"About five years ago the Goodyear Tire & Rubber Co. began to develop tires to fit the peculiar requirements of the aeroplane. It was early discovered that resiliency was an important factor—that a live, spring tire actually aided the machine to get off the ground and helped to absorb the shock of landing. So Goodyear engineers began to experiment with cord construction, with the result that Goodyear cord tires for aeroplanes have been refined to a point of efficiency equal to that of its successful big brother for electric and gasoline cars.

"On aeroplanes, tires of large cross section are used to provide maximum cushioning ability to resist the lateral thrusts that occur when the machine side-swipes the earth in landing. On machines used for scouting in war, the cross section size is reduced one inch to reduce weight, thereby permitting the carriage of an additional amount of gasoline.

"The eminence of Goodyear in the aeronautic field is evidenced by the fact that more than 90 per cent of the aeroplane tires used by the forty American aeroplane factories are Goodyears. All of the machines in use by General Pershing's forces in the Mexican expedition are Goodyear equipped. On Curtiss, Wright, Burgess, Martin, Thomas and many other machines Goodyear cord aeroplane tires are standard equipment."

Aeroplane Aids Telephone

An aeroplane was used to make a telephone call when Raymond Stone, a Paterson (N. J.) aviator, tried to reach Bob Fowler, the first transcontinental flyer, at his hangar in Garden City, L. I.

When Stone called up the Wright Aviation School from New York, one of the pupils volunteered to get Fowler. He wheeled out a biplane, spun up the motor and dropped at Fowler's hangar, a mile away. He was back in three minutes.

Tillman Expects to Fly

United States Senator Tillman, head of the Committee on Naval Affairs, made a long examination on June 22 of the Curtiss military tractor aeroplane placed upon the lawn at the Capitol by *The World*, the Aero Club of America and Admiral Peary's organization for coast control.

"Old as I am, I confidently expect to fly back home from here some day in an aeroplane of this or some other type," announced Senator Tillman.

In the same party were Senator Chamberlain, Chairman of the Committee on Naval Affairs; Senator Ollie James of Kentucky; Blair Lee, Chairman of the Committee on Coast Defenses; Gilbert M. Hitchcock of Nebraska, Brady of Idaho, and Alden Smith of Michigan.

Augustus Post, of the Aero Club of America, was present to explain to the Senators the points of the machine. In the bow of the aeroplane, A. Jackson Stone, of the General Ordnance Company of New London, Conn., had fitted a gun.

Senator Chamberlain also was familiar with the tractor, as it is the exact duplicate of the one which flew from Newport News to New York and from New York to Washington with passengers and mail, and which he officially inspected when the machine reached Washington on May 25 after making the 325 miles from New York in 247 minutes.

Col. Squier, the new Aeronautical Chief of the Army, was another official visitor. So also were Capt. Clark and Lieut. Milling of the army aviation section, and Naval Constructor Richardson, under whose direction a large hydro-aeroplane is being constructed at the Washington Navy Yard.

(*Continued from page* 526)

"Aeroplanes are rapidly growing in size and speed, and there are aeroplanes being constructed to lift fifteen tons, and which are undoubtedly capable of flying across the Atlantic. What the next five years will bring forth no one can anticipate, but after witnessing the tremendous development that has taken place in the past three years, we cannot but admit that the next five years will see the advent of the Aerial Age—the employment of aircraft for general utilitarian purposes.

"Considering the marvelous sociologic and economic revolution which has been brough about by the advent of fast transportation and intercommunication, it does not require undue prescience to foresee a greater economic and sociologic revolution as a result of the advent of the Aerial Age.

"Whereas, the automobile, the railroad and other terrestrial means of transportation, and the ship, must halt before obstacles, and progress is limited to over land in the first instance and over water in the second, the progress of the air craft is unhindered and unlimited. Human flight has opened the sky to men, giving a new road in which to travel, and because it is a road free of all obstructions and leads everywhere, affording the shortest possible distance to every other place, it offers to man, in its prospective developed stage, unlimited freedom.

"Spanning continents like railroads, bridging seas like ships, going over mountain, forests and all physical obstructions like the bird—the aircraft brings the elimination of frontiers and the physical connections of nations.

"Young men who are now in Universities fitting themselves for active life are the men who will live in this new age—and they have much to give and much to receive from it.

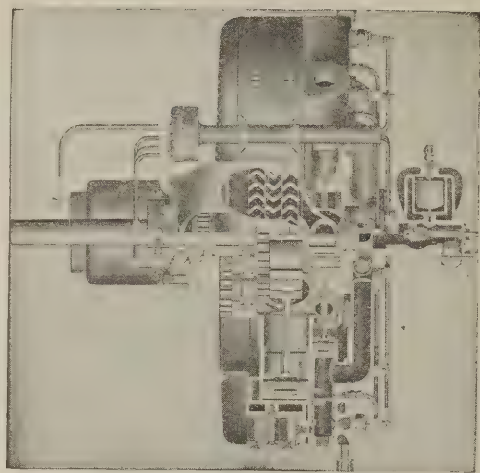
"Through the tremendous strides forward of aeronautics there are wonderful possibilities for the employment of ingenuity, genius and skill, and business opportunities, as great as have ever been created by progress in important lines of human endeavor.

"Problems of engineering as huge as were solved by Goethals and other master builders; juridical and legal questions to be decided as stupendously difficult as any Gladstone would wish them; possibilities for the development of international relations greater than were ever conceived; problems of transportation to be solved by the application of aircraft, as wonderful as any economist could wish; opportunities to gain distinction splendid enough to satisfy the most ambitious person.

"Assuring you of our hearty co-operation, we remain

"Very sincerely yours,

"(Signed) HENRY WOODHOUSE,
*"Member of The Executive Committee,
Aero Club of America."*



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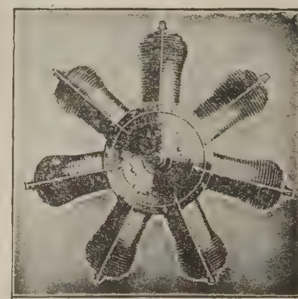

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Vacations Wanted

If you could rescue one little child or one overworked mother from the city's hot, glaring walls and pavements from which they have no escape except into stuffy rooms whose stifling air is even more oppressive than that of the sun-baked streets and roofs; and

If you could give them an outing at the beach with bountiful food, rest, coolness, fresh air, a daily dip in the surf, shady porches and sandy beaches, would you not regard such a gift as well worth giving?

Such a gift is entirely within your power. Ten thousand of these mothers and children are waiting for invitations to our Sea Breeze Summer Home. You can send as many as you will for a day a week or a fortnight.

Allow 50 cents a day or $3 a week for each person, and direct your gift to George Blagden, Treasurer.

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CORNELIUS N. BLISS, Jr., President

Room 200

105 East 22nd St. New York City

Volunteers are wanted in every town to plan a fair, sale, entertainment or lawn party to raise special Sea Breeze vacation funds for certain poor mothers and children whose circumstances are particularly distressing, and whom clubs, societies, classes, schools or churches can adopt as their special guests at Sea Breeze. Write for suggestions for planning a fresh air fund fair in your own town or your summer home.

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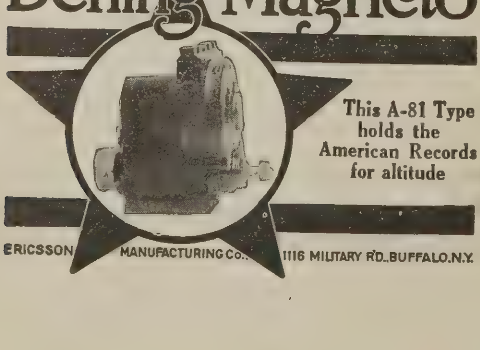

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President Wilson Authorizes Aerial Reserve

As a result of the recent visit to Washington of a committee of the Aero Club of America, headed by Messrs. Alan R. Hawley and Henry Woodhouse, President Wilson and Secretary Baker have taken personal interest in the development of the air service.

When it was brought to the attention of the President that all development of the air service beyond the one increment provided by the Army Reorganization Bill must stop for lack of personnel unless he authorized the Officers' Reserve Corps and the Enlisted Men's Reserve Corps, President Wilson promptly took the necessary steps, and on July 13 signed the order putting into effect the Officers' Reserve Corps and Enlisted Men's Reserve Corps.

This measure is far-reaching, but the plan to form the aerial reserves has not yet been decided upon. Details will be published as soon as decision is reached.

Prominent Men Organize Aerial Coast Patrol Unit

THE first steps to establish a complete unit of the Aerial Coast Patrol in New York were taken July 10, when Mr. F. T. Davison, son of Mr. H. P. Davison, of J. P. Morgan & Co., ordered a 90 h.p. Curtiss flying boat, and with Mr. Robert Lovett, son of Judge Lovett, the railroad financier, Mr. Allan Ames, Mr. H. D. Sturtevant, and Mr. C. D. Winam —all Yale men—reported to the Wanamaker Aviation School at Port Washington, Long Island, to begin training in aviation.

The plan of Mr. Davison and his associates is to form a unit composed of twelve men, all trained in aviation, four of whom will act as pilots, four as observers, and four as anti-aircraft gun men. There will also be added two experts in wireless telegraphy, one to direct the installation and operation of wireless apparatus on the saplans and on to operate a land radio station, which will receive the messages from the seaplanes.

The equipment of the unit will consist of four seaplanes and the automobiles and motor boats required for the anti-aircraft side of the unit.

All of the members of the unit will learn to fly, as the observers should be able to land the aeroplane should the pilot be wounded while on a scouting expedition; and the four members of the anti-aircraft gun service must know the operation of aircraft, so as to be able to fight other aircraft, both in air and on land. Therefore, twelve aviators must be trained for each unit, and while they are being trained, there will take place the division; the four best adapted to pilot the aeroplanes will become the pilots; the four most adapted to become observers will become the observers, and the four best adapted for the anti-aircraft gun service will become the anti-aircraft gun men.

The plan for the Aerial Coast Patrol System was proposed by the Aero Club of America some months ago, and has been developed by the National Aerial Coast Patrol Commission, of which Rear Admiral Robert E. Peary is Chairman. The other members of the Commission are: Central Committee, Senator Charles F. Johnson, Senator Morris Sheppard, Representative Julius Kahn, Representative Charles Lieb, Hon. Byron Newton, Assistant Secretary of the Treasury; Hon. William M. Ingraham, Asst. Secretary of War; Dr. E. Lester Hones, Supt. U. S. Coast & Geodetic Survey; Prof. H. C. Frankenfield, U. S. Weather Bureau; Hon. Emerson McMillin, Mr. John Hays Hammond, Jr., Representative Murray Hulbert, and Mr. Alan R. Hawley, President of the Aero Club of America. The State members of the Commission are the Presidents of the Affiliated Aero Clubs of the country; the Adjutant Generals of the several States; the commanding officers of the Naval Militia of the Several States. The Secretary of the Commission is Mr. Earl Hamilton Smith.

President Wilson, and the War and Navy Departments, have given their indorsement to the Aerial Coast Patrol System, and a few days ago Senator Charles F. Johnson, of Maine, introduced a bill in the Senate providing an appropriation of $1,500,000 for establishing this System of Aerial Coast Defense throughout the United States.

In endorsing Senator Johnson's bill, in a letter to Senator Tillman, Chairman of the Committee on Military Affairs, Mr. Henry Woodhouse, member of the Board of Governors of the Aero Club of America, pointed out that the sinking of the "Lusitania" could never have taken place if the Irish Coast had been protected by a system of aerial coast patrol such as is proposed.

Mr. Woodhouse's letter to Senator Tillman follows:

"The sinking of the 'Lusitania' less than ten miles from the Irish Coast could never have taken place if the coast had been protected by a system of aerial coast defense such as has been proposed by the Hon. Charles F. Johnson, Senator from Maine. A few million dollars employed in such a system of coast defense would have prevented that awful tragedy.

"At the time of the 'Lusitania' tragedy, Great Britain had only fifteen aviation stations; to-day it has ninety-four stations, and it has hundreds of anti-aircraft gun squads. It behooves us to learn the lesson now.

"In case of war, nothing else could afford as good protection to our shipping and shipping centers, and the people living along the coasts, as an efficient system of aerial coast defense.

"It costs only $1,500,000 to establish a chain of stations along our coast, the stations to be one hundred miles apart, each having four aeroplanes and a personnel consisting of four aviators, four observers, a wireless operator, and mechanicians and assistants.

"Recently an officer of a foreign country stated that this system of Aerial Coast Patrol is an admirable conception, most efficient and economic.

"We have in the past six months received applications for assistance to train officers and supply aeroplanes for the Naval Militia from every State of the Union which has such an organization, also from civilian organizations in different States. In quite a number of States the first steps have been taken to organize units of the Aerial Coast Patrol. All that is needed is the encouragement and support which Senator Johnson's bill will provide.

"We hope, therefore, that you and your Committee will give your hearty approval to Senator Johnson's bill."

Mr. David H. McCulloch, the well-known American pilot, who has just returned from Italy, where he instructed officers of the Royal Italian Navy in aviation, and is now in charge of the Trans-Oceanic Aviation School at Port Washington, Long Island, which is part of the aviation being established by Mr. Rodman Wanamaker in connection with the plan to fly across the Atlantic, is the instructor of the members of the Aerial Coast Patrol Unit.

Mr. Davison's flying boat will be delivered in a few days. In the meantime, a brand new 100 h.p. Curtiss flying boat is being used for the training. Other members of the unit also expect to order flying boats or seaplanes in the near future.

The plans for this unit were developed by a committee consisting of Rear Admiral Robert E. Peary, John Hays Hammond, Jr., Alan R. Hawley, President of the Aero Club of America, and Henry Woodhouse, member of the Board of Governors of the club. The plans were submitted to Assistant Secretary of the Navy Franklin D. Roosevelt, who approved them, and assured the members of the unit that the Navy Department appreciates their patriotism and public spiritedness and will do everything in its power to encourage this development throughout the country. This committee met at the Aero Club of America, 297 Madison avenue, to consider the plans to make this unit as complete and perfect as possible, so that it will be the model unit, and will set the standard to be adopted in organizing other such units throughout the country.

First Aero Company N. G. N. Y. Mustered In

THE First Aero Company of the New York National Guard was mustered in July 13 and accepted in federal service.

The mustering in took place at the Garden City Aerodrome. The company was lined up, divided into four sections, each in charge of an officer, in front of the four aeroplanes owned by the Aero Company. The mustering officers were Captain J. L. Gilbreth, U. S. Infantry and Major Carl F. Hartman, U. S. Signal Corps; Messrs. Alan R. Hawley, President, and Henry Woodhouse, of the Board of Governors, represented the Aero Club of America which started this Aero Company by supplying the funds necessary for the training aeroplanes, through the National Aeroplane Fund instituted by the Aero Club of America for this purpose. Miss Phyllis R. Hartman, daughter of Major Hartman, witnessed the mustering and was the Aero Company's mascot.

The personnel of the Aero Company, which includes many members of prominent New York families, as mustered in, was as follows:

Captain Raynal C. Bolling, Lieutenant N. Carolin, J. E. Miller, A. B. Thaw, 2nd, Master Signal Electrician, R. J. Gilmore; First-Class Sargeants, P. R. Stockton, F. R. Dick; Quartermaster Sargeant, W. T. O'dell; Sargeants, J. H. Stevenson, E. A. Kruss; Corporals, D. G. Frost, D. R. Noyes, E. B. Hagerty, W. P. Willetts, J. R. Speyers, H. H. Salmon, Jr., P. J. Roosevelt, F. J. Hoppin; Privates, E. C. Best, F. Boger, Jr., K. J. Bevens, W. W. Conant, Jr., A. M. Craig, J. T. Dwyer, A. L. Favre, C. C. Goodrich, P. J. Henry, W. T. Howell, J. F. Hubbard, W. C. Jenkins, W. J. Johnson, R. J. Knowlson, E. McCormick, E. Martin, D. P. Morse, R. M. Olyphant, Jr., C. H. Reynolds, R. F. Russell, P. D. Smith, J. D. Sullivan, T. F. Ward, and Trumpeter, W. L. Rockwell. The mustering in took place just before the storm broke loose and was hastened by the storm, which prevented the making of flights by the pilots of the company, which has four pilots who have made between 100 and 180 flights each and four pilots who have made between 50 and 100 flights each.

Two of the aeroplanes owned by the Aero Company having been worn out in the training of the men, new machines will have to be provided by the Federal Government. This cannot be done until the Army Appropriation Bill, with the provision for organizing the Militia Aero Squadrons is passed by Congress. The appropriation for militia aeroplanes was included in the Army Appropriation Bill by the Senate and must now be approved by the conferees of the House of Reresentatives who are Congressmen James Hay, of Virginia; Hubert Dent, of Alabama, and D. R. Anthony, of Kansas. Both the Army and the Militia are waiting for the passage of this bill, to go ahead. Lack of funds is practically bringing everything to a standstill. The Second New York Aero Company, which was organized in Buffalo with Captain John M. Satterfield, President of the Aero Club of Buffalo, as head, has been recognized by the Federal Government and is coming to New York to be mustered in in a few days at the Garden City Aerodrome.

New York a Military Aeronautical Center

AS a result of the mobilization of the National Guard in connection with the critical conditions at the Mexican frontier, which has brought out the necessity of organizing the twelve Militia aero squadrons for the twelve Militia Divisions, as provided for in the Organization Tables to provide air scouts to meet an emergency, New York has become a military aeronautical center, and Militia officers of a number of States have been ordered here by the War Department for inspection and physical examination.

A number of civilian aviators who offered their services to the Federal Government have also been ordered to New York and are now here waiting for the Army Appropriation Bill to go through, so that the War Department can acquire aeroplanes with which to give them further flying practice and put them as well through their preliminary tests, after which they will probably be formed into classes and given further training, either at the Garden City Aerodrome, the free use of which has been given to the Army by the Wright Company, or to the aviation training schools to be established at San Antonio or Chicago.

The National Guard officers who had been taking a course of training in aviation at the expense of National Aeroplane Fund of the Aero Club of America, when the call for more aviators for the Mexican border came, promptly offered their services to the Army, through the Aero Club of America, and the Army promptly accepted them, subject to physical examination and ordered them to New York for the examinations. These examinations have been given under the direction of Major Carl F. Hartman, U. S. Signal Corps, and Lieut. J. E. Carberry, who has been an Army aviator, and who has been put in charge of the Garden City Aerodrome.

The officers of different States who have already passed their examinations and are now waiting for the Army Appropriation to go through Congress so as to continue their practice, include the officers of twenty different States, with ranks varying from sergeant to captain.

Lacking the necessary funds the War Department has not been able to take steps to organize additional aero squadrons. Therefore, the only Militia aviation organization that actually has an aeroplane is the First Aero Club of the New York National Guard, which was mustered in last Thursday, and which has four aeroplanes, which were supplied by public subscriptions, through the National Aeroplane Fund of the Aero Club of America.

The appropriation of $9,640,200 to organize, equip and maintain the twelve aero squadrons for the twelve Militia divisions is now being considered by the conferees of the House of Representatives, whose approval is expected, although it is not assured.

Commenting upon the situation, Mr. Alan R. Hawley, president of the Aero Club of America, issued the following statement:

"The organization of Militia aero squadrons is the only solution there is to supplying this country with half of the 300 military aviators which we should have immediately. In the regular Army the shortage of officers has made it almost impossible to get the number of officers required for the air service. Although it is nine years since the Army acquired its first aeroplane, we have to-day only twenty Army aviators.

"The Militia has many suitable, willing candidates for the air service. We find, in fact, that it is easier to get a large number of Militia officers to take up aviation than it is to get money from Congress for training and equipping them. The delay in passing the $9,640,800 appropriation for organizing the twelve aero squadrons is delaying the work of organizing these squadrons, and causing considerable trouble in some States where many volunteers had actually left their positions to prepare themselves to enter the air service. In Nebraska thirty-five National Guardsmen who had left their positions to enter the air service, after waiting two weeks, are looking for new positions and are going back to work."

Air Voyage Next!

(Editorial in N. Y. *Sun*)

THE idea of transatlantic flight takes new force from the arrival of the U-boat merchantman at Baltimore. The more sanguine birdmen now foresee a schedule of "New York to London in thirty hours" by the air lanes. There is talk already of a super-Zeppelin to arrive at an American port next month.

It is more than coincidence that such feats should be attempted and effected at a time when a great war rages. Necessity drove the Germans to develop the super-U-boat for communication with the outside world. If transatlantic flight is still a dream it is a dream which the lessons learned by aviators over European battlefields will help to realize.

Is it worth the price in blood, this quicker development instead of a slower achievement which seemed sure? The only answer is: Without the goad of war, against Nature as well as against human enemies, would we have had the stimulus, imaginative and spiritual—although this may shock the pacifist—to progress as far even as the upper Stone Age?

The News of the Week

New York Flying Yacht Club Procures Site for Hydroaeroplane Station

The committee representing the Harlem business men have received permission from Commissioners Cabot Ward and R. A. C. Smith to use the North River front, just south of the recreation pier, at 129th street, for an indefinite period, for the purpose of conducting a hydroaeroplane station and club house.

Military and civilian aviators' training quarters, a public service station for owners of flying boats and last but not least, one annual event that the club intends to foster, "The Manhattan Island Derby," for a beautiful trophy valued at $5,000, together with a similar amount in cash to be awarded as a prize for the fastest hydroaeroplane competing. The cash prize and trophy have already been assured; the latter will be designed by Mr. Henry Woodhouse, designer of the Curtiss Hydroaeroplane trophy. This with the many other trophies, the cash prizes already created and others to be furnished, will assure keen interest and competition in the annual manœuvres for passenger carrying, world's altitude, weight carrying and other records.

The authorities of the Aero Club of America and many other patriotic citizens of New York are highly elated over the success of the Harlem business men's efforts, as they realize the importance of such a station as the New York Flying Yacht Club intends to create on Manhattan Island.

Garden City Aerodrome to be Aviation Camp

Arrangements are being made to provide camping facilities for aviation students on the Hempstead Plains Aerodrome, now under lease by The Wright Company. When these are completed the live, red-blooded young men who want to take their vacation in the open, learning to fly, can come out under a semblance of military conditions.

The First Aero Company, Signal Corps, New York National Guard, is now encamped on the Wright Aviation Field, where five sheds are set apart for the company's use.

The company has been accepted by the Federal Government and included in mobilization orders, in the same manner as the troops at Beekman, N. Y. Members are taught camp sanitation, drill, flying, training as aero mechanics and all other branches of the military art.

Zeppelin Line to U. S. an Early Possibility

Zeppelin service between the United States and Germany is a thing of the near future, according to Captain Koenig, who brought the first merchant submarine into an American port. City officials who visited the Deutschland quote the captain as saying that airship freighters are under construction in Germany for transatlantic passage.

"To you," Captain Koenig was quoted as saying, "the trip of the Deutschland is a great achievement, but you mustn't be too enthusiastic over it, for a bigger surprise is coming.

"A great Zeppelin airship—or maybe I should say airships—are being built in Germany. In the not distant future one or more of them will sail through the air to the United States. Just as sure as the Deutschland came to America, so will the Zeppelins come."

Aviation Exhibition at Long Branch

The management of the First Annual Summer Capitol Affair at Long Branch, beginning August 2, and ending August 9, are offering an opportunity to aeroplanes, automobiles and accessories manufacturers to display and sell their goods.

It is contemplated that Long Branch will be the Mecca for thousands of tourists who will come for the express purpose of seeing the summer White House. They are concentrated upon the aeroplane exhibits and are planning to make it foremost among the many attractions.

The aviation grounds are well equipped for such an exhibition and the aviation field, measuring nearly 500,000 square feet, affords ample room for several machines to take off at one time. Six hundred feet of a straight way is provided opposite the grandstand in the main exhibition ground for exhibition plant.

The star attraction, which will undoubtedly arouse much enthusiasm, will be the blowing up of a dummy ship at sea by a well-known aviator from an aeroplane. This exhibition will be given for the express purpose of showing the value of aeroplanes, in case the coast should be attacked by a battleship. It is the purpose of the management to repeat this performance each evening. The aeroplane will be lit by various colored fire works, and at a signal the big aeroplane will soar in the air in the direction of the Atlantic which is only two blocks from the grounds and forge directly over the boat. The aviator will drop bombs and blow up the ship. Every effort is being made to have President Wilson deliver an address at the affair.

The ceremony at the christening of the captive balloon "LUNA," at Luna Park, Coney Island.

Left to Right: B. B. Jones (in rear) Miss R. Richards Chance, Rodman Law, Mrs. O. C. Jurney, (in rear) Mrs. Rodman Law, Mrs. F. Walker Winch, Miss Estella Birney, who did the christening; Mr. O. C. Jurney, Luna's manager, Frank Seyfang, (in rear) Frank T. Buell, Leo Stevens.

Contracts Let for 28 New Aeroplanes

Contracts have been let by the War Department for twenty-eight new aeroplanes, exclusive of the twelve machines now in Mexico. The machines will be rushed to the border as soon as ready, pending the completion of the army's comprehensive plan to equip the twelve militia divisons with air squadrons at a cost estimated at $9,640,800.

The Senate Military Committee's appropriation of $13,-981,666 for aviation has stimulated widespread interest throughout the country, and the aeronautical branch of the War Department is fairly buzzing with work, which it is expected will be incidental to placing the United States on an efficient basis with regard to its aerial service.

Officers explain that all signs point to an awakening in the country to the importance of this new branch. It is said that such big concerns as the General Electric Company, the Westinghouse Electric, the Bethlehem Steel Company and others are giving consideration to the possibilities of extending their facilities to the development of aviation for the government, with a view, perhaps, to putting the United States among the leading nations of the world.

The present aeroplane companies which deal with the government are the Curtiss Company, the Sturtevant Company, the Standard Company, Martin Company, Thomas Company, L. W. F. Company, Burgess, Aero-Marine, Gallaudet, General, Empire State and Eastern Company.

It is expected that these and others will have their hands full in supplying the needs of the War Department when the plans for the development of the aerial service begin in earnest.

Navy Aeronautic Officers Visit Packard Factory

A detail of petty officers in the navy from the Navy Aeronautic Station, Pensacola, Fla., in charge of Lieut. R. T. Young and Lieut. J. C. Monfort, visited the Packard factory recently to study the Twin Six motor as to its suitability for use in navy aircraft.

C. M. Burt, of the motor inspection department, was detailed to instruct the visiting detail as to the various features of the motor and to explain its principles of design. The men devoted two days to this study.

During their visit in Detroit several other automobile plants were inspected and some time was given to the study of other types of motors.

Because of the continuous even flow of power, the absence of vibration and the ability to endure long periods of sustained speed, Lieut. Young was very favorably impressed with the Twin Six type of engine.

Aviation Trips Furnish Resort Visitors Thrills

Visitors to Atlantic City are showing much favor to aviation, with the result that the two stations conducted there by E. Kenneth Jacquith, scion of wealthy Chicagoans, and Beryl E. Kendrick, millionaire sportsman, do a land office business. The competition, however, is keen, with the result that enthusiasts are enjoying the benefits of a rate war. Jacquith accepts passengers at $15 a head, while his rival has boosted his scale to $25 a trip. The latter suffers little with the big demand by the venturous ones, and in addition Kendrick increases the tax on the strength of his earlier experience with the United States Aviation Corps.

Kansas City Aero Squad Complete

The roster of the aero squadron of Kansas City is complete. The list of volunteers was closed at a meeting of the squadron at the Signal Corps Armory, 3608 Main street, with 105 names upon it. The squadron, however, will be open to men who have had experience in flying, Capt. J. A. Calvin said.

"By October, with the assistance of the Aero Club of Kansas City and the Aero Club of America, we expect to have four planes of our own," Captain Calvin said, "The organization is part of the signal corps and, necessarily, is a part of the National Guard of Missouri. Other equipment, such as motor cycles, trucks and aeroplane hangars, will be obtained."

Fifty men reported for drill at the armory.

Luna Park's Captive Balloon

What promises to be one of the most attractive enterprises at Luna Park, Coney Island, is the captive balloon which was christened by Miss Estella Birney on July 4, and is now in service. The christening took place in the presence of more than one hundred thousand persons, among whom were representatives of the Aero Club of America. Following the ceremony an ascension was made by Miss Birney, Mr. O. C. Jurney, Luna's manager, and Pilot Frank Seyfang.

Several previous attempts have been made to operate a captive balloon at Coney Island, but each ended disastrously. Undaunted by the failure of others, Mr. Jurney set out to install one which would be a success. That he registered an achievement is demonstrated by the popularity it has already attained.

The balloon was built by Leo Stevens and is in charge of Frank Seyfang. It is operated by a 25 h.p. electric hoist and daily ascensions are made when the weather permits. There is a carrying capacity of three passengers. Searchlights are played on it from various points in the park, making it attractive to persons within a radius of several miles.

Aviation Section N. Y. Naval Militia

Members of the 1st Battalion, N. Y. Naval Militia started on Sunday, July 16th, for two weeks of continuous training at Bay Shore, L. I. The officers and men are to be complimented on their systematic and practical work. Thirteen flights were made Sunday morning. A slight mishap delayed flights until late in the afternoon.

Under Vincent Astor, the 2d Battalion has established a training camp next to the 1st Battalion camp, and with Ensign Pierce as instructor, will give a two weeks' course of instruction on the new Burgess-Dunne machine. While flights are being made, the waters are patroled by Mr. Astor's speed boat, Mystery II.

Frank H. Burnside, Lieut. Anthony Sunderland, Conn. National Guard Student, James D. Hill, Instructor. Corp. Chas. Robbins, Ark. National Guard Student at the Thomas School of Flying. Lieut. Sunderland is Mayor of Danbury, Conn., and the first mayor in the United States to take up aviation in the interest of "Preparedness."

Passenger Carrying at Bay Shore

After flying from New Haven to Bayshore, L. I., with their Curtiss Flying Boat, Harry Witts and Alfred Croft, recently graduated from the Curtiss School, have established a passenger carrying station, and flights are made whenever weather permits. Thirty passenger carrying flights were made last Sunday, and the number of spectators and prospective passengers gave ample evidence of the interest created in this section.

Urges Action by House on Aero Squadron Bill

The Providence Chamber of Commerce has endorsed the Senate approval of an appropriation for equipping and maintaining aero squadrons which would give a substantial aero section to the National Guard of Rhode Island. General Secretary Clarence A. Cotton has sent telegrams to Congressmen James Hay of Virginia, S. Herbert Dent of Alabama, and D. R. Anthony of Kansas, the House conferees on the bill, urging joint action on the part of the House.

Burgess News

Eben S. Draper, of Hopedale, son of the former Governor of Massachusetts, has completed arrangements for the purchase of an aeroplane for the use of the Massachusetts Naval Militia. The machine is already under construction by the Burgess Company here and will be delivered about the middle of next month. This will give the Bay State naval forces a total of five aeroplanes. This is a greater number than is possessed by any other State in the Union, not even excepting New York.

The design follows that of the machine delivered early in the season to Vincent Astor, of New York, for the New York Naval Brigade. It has a maximum speed of seventy miles an hour, a minimum speed of under forty miles an hour, climbs with full load on board, including the weight of a passenger, at the rate of 250 feet a minute. The power plant is a Curtiss motor of 110 horsepower.

At the present time Mr. Draper is at Buffalo with the Harvard Aero Corps, of which he is in active charge. On his return he will fly his new machine at Marblehead, which is the headquarters of the Tenth Deck Division of the Massachusetts Naval Militia, and its aeronautical section. This section, in addition to Mr. Draper, includes Norman and Godfrey L. Cabot, Geo. R. Fearing, Gordon Balch, Bayard Tuckerman and Clifford L. Webster, aviator of the Burgess Co. This section will have at its disposal four seaplanes, which with the fifth to be operated by the Ninth Deck Division at Newburyport, will give the Bay State its total of five naval aeroplanes.

"The Society of Automotive Engineers"

If proposed amendments of the constitution of the Society of Automobile Engineers, which will be voted upon at the annual meeting of the S. A. E. in January next are adopted, the name of that organization will be changed, and will become The Society of Automotive Engineers, and will have affiliated with it automobile, aeroplane, motor boat, tractor and stationary internal combustion engineers. Each engineering body probably will retain its individuality and be the authority in its particular field.

Activities of the new S. A. E. will be conducted with the co-operation of the Government in the establishment of standards and in the furtherance of the industrial preparedness movement.

Already the aeronautic engineers have taken steps toward affiliation with the S. A. E. and the motor boat and tractor societies unofficially have signified their desire to later enter into such arrangements.

Actual completion of the plan of affiliation in the new S. A. E. rests with the Council of the Society of Automobile Engineers and the officers of the other societies.

Briefly, and with as much condensation as it is possible to bring to the necessarily complicated subject, the society in its new form is to be one of the important means by which the various departments of the Government at Washington will get in close touch with the industrial facilities of the internal combustion engineering forces of the country, and unite them under a system that will place every manufacturing plant at the disposal of the authorities in case of need in the minimum time and bring into action such privately owned transportation equipment as may be needful.

Chamber of Commerce of Indianapolis Urges Militia Aeronautical Appropriation

Believing in the largest measure of aerial preparedness for the United States Army and Navy, the military affairs committee and the executive committee of the Chamber of Commerce have taken formal action to urge citizens of Indianapolis to ask the passage of a bill pending in Congress for the appropriation of $9,640,800 for aerial squadrons. Under the terms of the bill, which has passed the Senate and is awaiting the approval of House conferees, twelve districts will be formed in the United States, and it is expected the Indiana National Guard will comprise one such district. Persons interested in aerial preparedness are requested by the Chamber of Commerce committee to telegraph or write their representatives and senators and appeal particularly to Representative James Hay, of Virginia; S. Hubert Dent, of Alabama, and D. R. Anthony, of Kansas, who compose the House conference committee.

Exports of Aeroplanes

Aeroplanes and parts were exported during the week of July 9 as follows: To Great Britain, $117,494; to Argentine, $64; total, $117,558.

The Burgess-Curtiss flying boat, owned by I. Hector Borden, of Long Branch, N. J.

SCIENTIFIC RESEARCH IN AEROPLANE CONSTRUCTION AT THE FACTORY OF THE CURTISS AEROPLANE & MOTOR CORPORATION

THE aeroplane industry, the youngest of all industries, is beginning to set examples of efficiency to the older industries. Now that aeroplanes are employed by the thousand, aeroplane manufacturing has become an extensive industry which affords employment to thousands of men and has "on the books" about $50,000,000 of business in the United States alone, and aeroplanes are increasing in size, power and efficiency with tremendous rapidity. The demands for the most scientific methods in aeronautical affairs is apparent.

The aeronautical industry has added an enviable distinction to the already long list of distinction to which this country can be proud. The largest aeronautic research and testing laboratory in the world is now to be found in the United States and is the new completed Research and Test Department of the Curtiss Aeroplane and Motor Corporation at Buffalo, New York.

The announcement was made recently that Mr. Rodman Wanamaker had ordered a large flying boat, to be equipped with a number of motors totaling 1,800 H. P. This machine was expected to be capable of flying across the Atlantic. Some wonderment was expressed in many quarters as to the feasibility of this, but to the expert aeronautical engineers in this wonderful new laboratory it was merely a matter of calculation—simply a matter of applying on a large scale what had already been discovered on a lesser scale. When this new laboratory at Buffalo is finished it will be complete to the minutest detail, as is vouched for by the following recital of the facts.

The Engineering Department

When the Curtiss Aeroplane & Motor Corporation enlarged its manufacturing facilities at Buffalo, it provided for an engineering department proportionate in magnitude to the great aeroplane factory itself. This department comprises over 150 men, or about one per cent of the entire force directly employed, inside and outside the plant, in building Curtiss aeroplanes and motors; and it occupies a floor space of 30,000 square feet in the factory, together with additional testing laboratories outside of the factory.

The Engineering Department consists of four main divisions; first, the Motor Designing and Testing Department; second, the Aeroplane Designing Department; third, the Aeroplane Development Department; fourth, the Research and Test Department.

The Research and Test Department

The Research and Test Department comprises the following subdivisions:

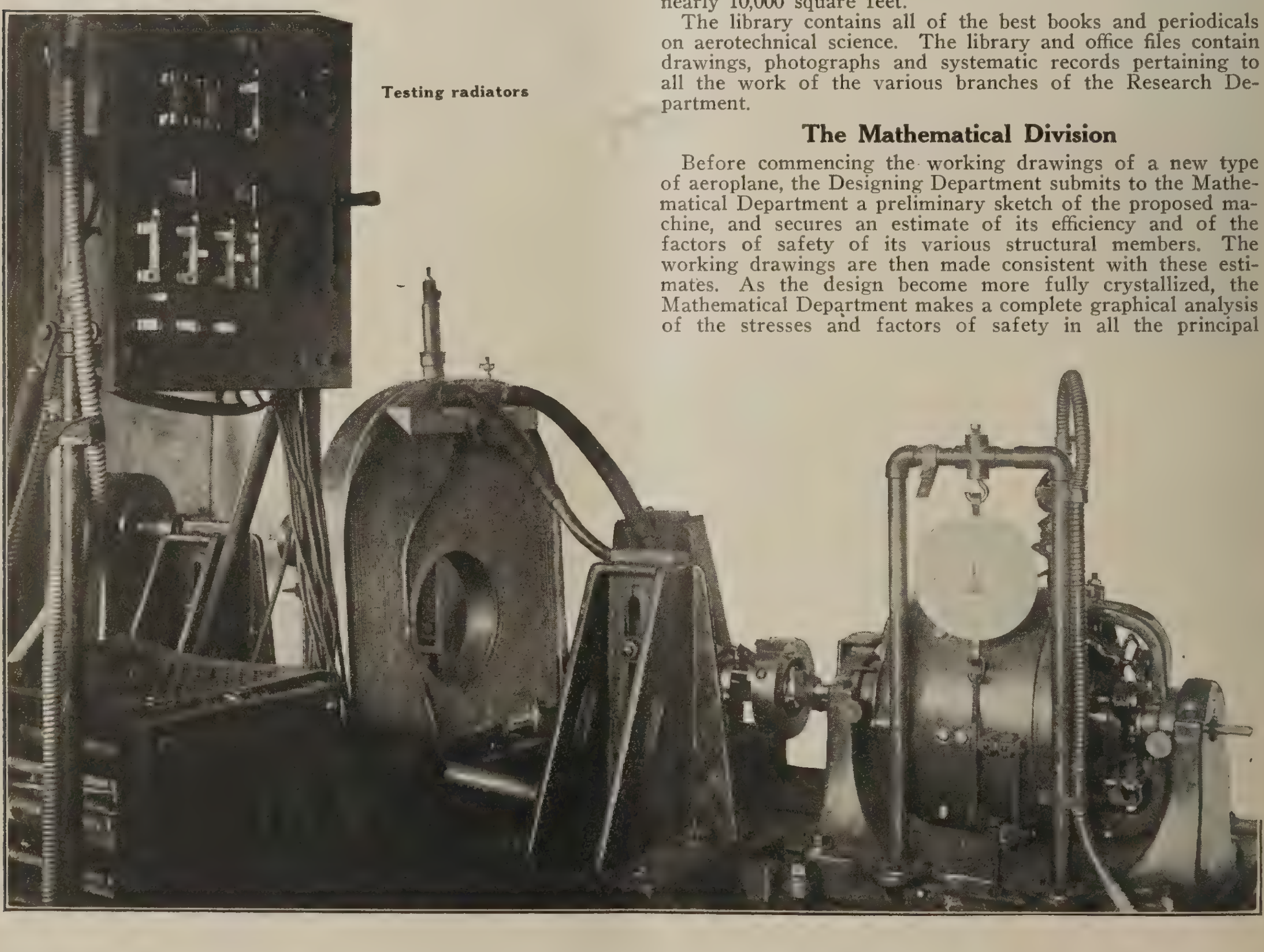
1. **The Mathematical Division,** for analytical and graphical analysis of stresses and strains of aeroplane structures.
2. **The Chemical Laboratory,** for the analysis of materials of construction.
3. **The Heat Treatment Laboratory,** for studying the proper heat treatment of steels and steel alloys.
4. **The Physical Laboratory,** for the mechanical testing of materials.
5. **The Structure Testing Laboratory,** for indoor tests of complete machines and their parts.
6. **The Aerodynamical Laboratory,** with a wind tunnel for model testing.
7. **The Propeller Designing and Drafting Division.**
8. **The Indoor Propeller Testing Laboratory,** for both static and running tests of propellers.
9. **The Outdoor Propeller Testing Laboratory,** for experimental studies with propellers in free air and in full flight.
10. **The Photographic Studio,** for making records of experimental tests and apparatus.

These divisions together with the library and offices of the Research Department comprise a floor space aggregating nearly 10,000 square feet.

The library contains all of the best books and periodicals on aerotechnical science. The library and office files contain drawings, photographs and systematic records pertaining to all the work of the various branches of the Research Department.

The Mathematical Division

Before commencing the working drawings of a new type of aeroplane, the Designing Department submits to the Mathematical Department a preliminary sketch of the proposed machine, and secures an estimate of its efficiency and of the factors of safety of its various structural members. The working drawings are then made consistent with these estimates. As the design become more fully crystallized, the Mathematical Department makes a complete graphical analysis of the stresses and factors of safety in all the principal



Testing radiators

members of the aeroplane. It furthermore computes and presents in graphical form the air resistances of the proposed craft, the power required to drive it, the rate of climb, the range of speed and corresponding angles of incidence, the gliding angle, the conditions of stability, etc. The quantities so obtained are subsequently checked by various experiments in the laboratories and on the flying field.

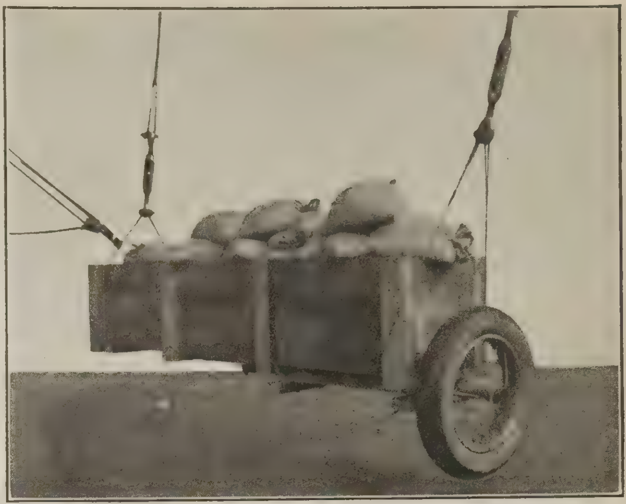
The Chemical Laboratory

The Chemical Laboratory is provided with all the necessary equipment for the analysis of steel alloys and various other metals, as also for studying the properties of dopes, paints, rust-proofing materials, fuels, etc. As the specifications for aeroplane materials, more especially metals, are very severe, it is necessary that frequent analyses be made of the raw materials and of the finished product such as forgings, welded pieces, etc. The steels used in aeroplane construction must in some cases have a tensile strength of ninety to one hundred tons per square inch (for wire much more), and, therefore, require a careful adjustment of their chemical composition so as to insure the required strength together with suitable ductility and hardness.

The Heat Treatment Laboratory

In many cases the requisite hardness, strength and elasticity can be secured only by heat treatment of the finished product. The proper treatment to be applied is determined by examination and experiment in a special laboratory containing instruments for the microscopic study of the structure of the material; for uniformly heating the material to an accurately measured temperature, then quenching it in oil and water and afterwards drawing it at an exactly measured temperature. A microphotographic apparatus is also used for obtaining and preserving a pictorial description of the crystalline structure of the specimens investigated.

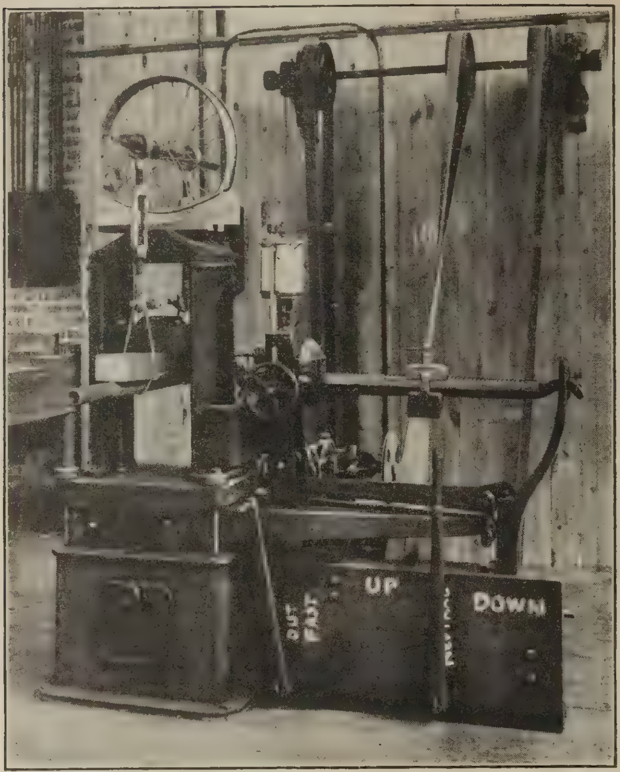
As various shipments of steel are received from the manufacturers, samples are taken from ten per cent of the stock



APPARATUS FOR TESTING AEROPLANE WHEELS AND TIRES FOR END THRUST.

This apparatus consists of a large heavy box, suspended by two parallel cables, and loaded with bags of sand. A tire is mounted on a wheel, and the axle to which the wheel is fastened is attached lengthwise to the under side of the box by two "U" bolts. By means of the turnbuckles, the cables are sufficiently lengthened to bring the wheel in contact with the floor and put considerable weight on the wheel. By the use of a rope attached to the box, it can be pulled back until the wheel is at any desired height from the floor, and then suddenly released, the energy being absorbed by frictional resistance between the tire and the floor. In case the wheel or tire does not fail or collapse by frictional resistance, a more severe test is resorted to, that of allowing the wheel to come in contact with a cleat fastened to the floor, at the instant of touching the floor.

The wings, supported as shown in the photograph, sustained a load of 13,800 pounds uniformly distributed, without rupture.



Rim of a 26" x 4" aeroplane wheel after it had collapsed under a load of 10,460 lbs.

and sent to the chemical laboratory for chemical analysis. Providing the chemical composition meet the specifications, the steel is released to the Production Department.

All of the heat treating done by the company is under the supervision of the laboratory, and is carried on in large gas furnaces. The laboratory requires the furnacemen to keep complete records of their work, to make sure that the heat treating is in accordance with the directions given them. From every lot of heat treated stock, several pieces are submitted to Brinell, scleroscope, fracture and bending tests, and a scleroscope reading is taken on every piece. In this way any improper heat treating or irregularities in physical properties can be detected immediately.

The equipment of the heat treatment laboratory consists of an experimental electric furnace, quenching baths, a Brinell tester, a scleroscope, a microscope, a pyrometer, equipment for polishing specimens for microscopic examination, a photomicrographic camera, and a Riehle testing machine for tension and compression.

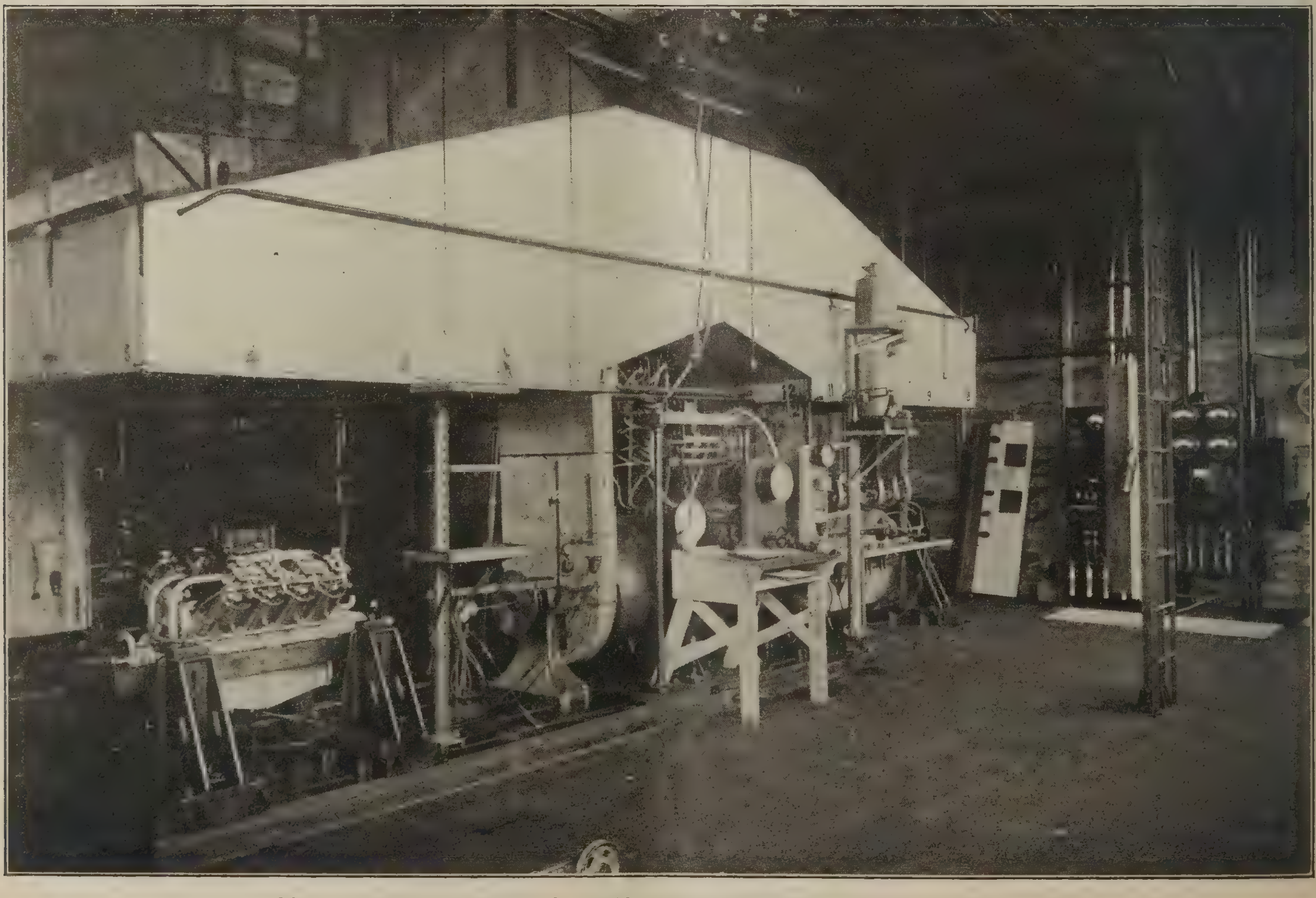
The Physical Laboratory

Coincident with the study of the chemical, thermal and crystalline properties of the materials, accurate tests of their mechanical properties are made, both of the raw materials and of structural parts. Such tests comprise measurements of the tensile and compressive strengths, elasticity, ductility, hardness, yield point, etc. Further tests are made of the rust-proofing qualities of materials and parts if they include metals. Some of the mechanical tests are made on woods and fabrics, which also are subjected to sunshine and rain to determine their weathering qualities. Glued parts are tested for many hours in air and water at various temperatures. Fabrics are subjected to hydrostatic pressure to determine their tensile strength in all directions.

The laboratory is equipped with the following instruments: Two Riehle U. S. standard, vertical screw power, testing machines, with dial screw beam, capacity respectively 20,000 lbs. and 100,000 lbs.; one dead weight machine for making Brinell or hardness tests, capacity 3,000 kg. (approximately 6,600 lbs.); one Mullen paper and fabric tester, capacity 360 lbs., which is also equipped with a fitting for testing oil gauges; one transverse testing machine for testing wood, and equipped with special fittings for testing cloth in tension, capacity 500 lbs.; one tachometer tester.

The Structure Testing Laboratory

Besides testing the properties of all the materials used in the Curtiss aeroplanes and motors, further experiments are made to determine the mass distribution, strength and factor



The largest dynamometer in the world employed for testing aeronautic engines.

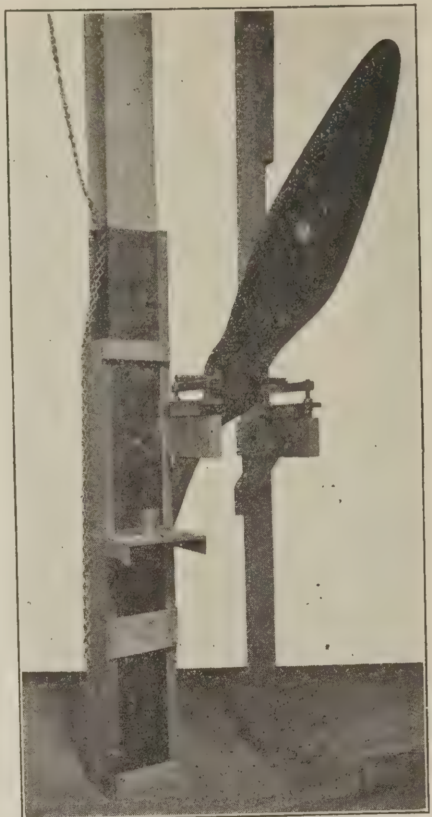
of safety of all the structural parts, and of the assembled machine. For example, the moment of inertia of the entire machine loaded for flight is determined by suspending the machine from the ceiling of the laboratory and allowing it to vibrate about its three principal axes; at the same time the center of gravity is accurately located. Again, the complete aeroplane is inverted and supported by its fuselage, while the planes of its wings are filled with sand so distributed as to represent the actual air pressure in flight. This sand load is then doubled, trebled, quadrupled, etc., until some member gives way. During the process of sand loading, the strain of all the principal members is recorded by special apparatus designed in the Research Department. Similiarly, the fuselage is loaded by successive increments, and the corresponding strains of all its principal members carefully recorded. Specimens of the ribs are subjected simultaneously to end loads and transverse loads proportional to those occurring in actual flight, as shown in the stress diagrams, and the corresponding deflections are noted.

The Aerodynamical Laboratory

For determining the aerodynamical properties of full scale aeroplanes and their structural parts, a special laboratory, 30x60 feet, has been set apart and provided with apparatus for generating a uniform current of air in which to expose models of the proposed aircraft and its structural parts. A wind tunnel of the latest British pattern produces a uniform stream of air four feet square in section and 30 miles per hour in velocity. In this current various models are supported from the sheltered arm of a wind balance which has its weighing beams outside the tunnel, and is adapted to measure accurately the lift of the model, the head resistance and the center of pressure at all different angles of incidence. The speed of the air is uniform to less than one per cent at all parts of the cross-section of the tunnel. The direction of the flow is parallel to the walls of the tunnel, truly to a small fraction of a degree. The tests therefore simulate the actual conditions of flight through free air, and enable the designers to predict the behavior of the full scale machine in the air.

The Propeller Designing and Drafting Division

In developing a new type of propeller, a tentative draft is first made on the drawing board and subjected to mathematical analysis. From the given dimensions and speed of a propeller are calculated the thrust, torque and efficiency of each section of the blade, and from these results are computed the aggregate thrust, torque, thrust power, torque power and efficiency of the whole propeller. When these properties are finally made satisfactory, accurate scale drawings and blue prints are made, and from these templates are constructed for use in the propeller factory. Simultaneously estimates are made of the structural strength of the blade and the internal stresses due to centrifugal force and air pressure. From the resultant stresses within the blade, and from the predetermined tensile and compressive splitting strength of the wood, the factor of safety of the blade is computed. In designing the sheet metal propeller tips, the centrifugal force of each portion of the sheathing is com-

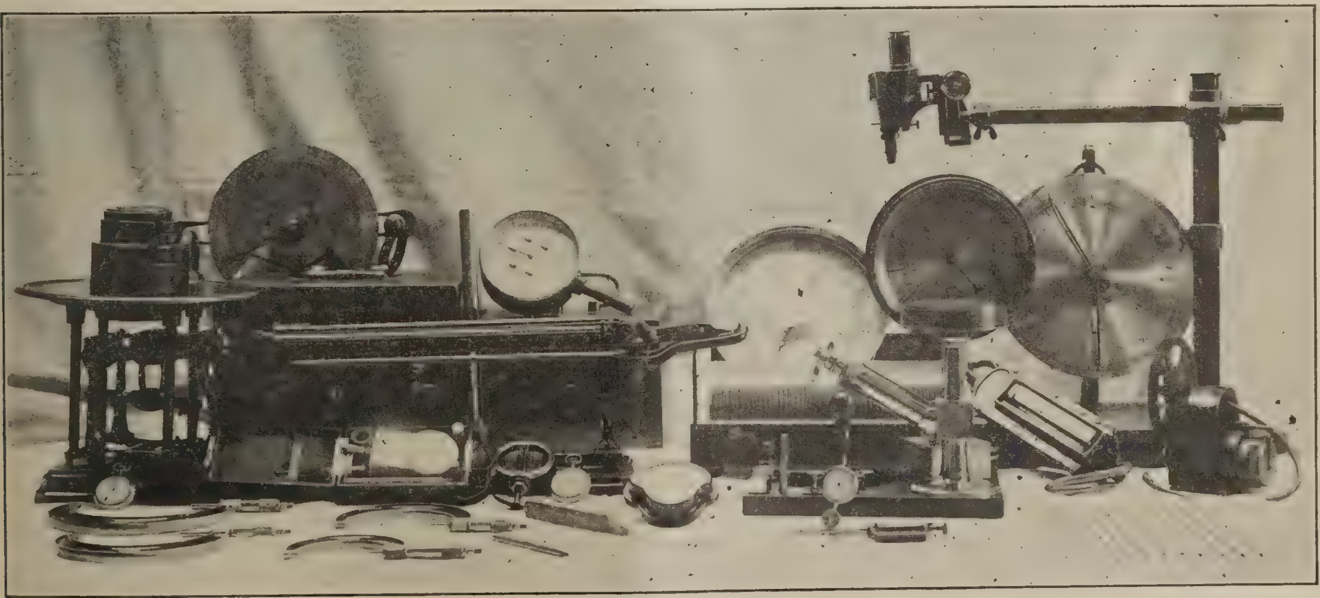


Testing propellers for proper balance

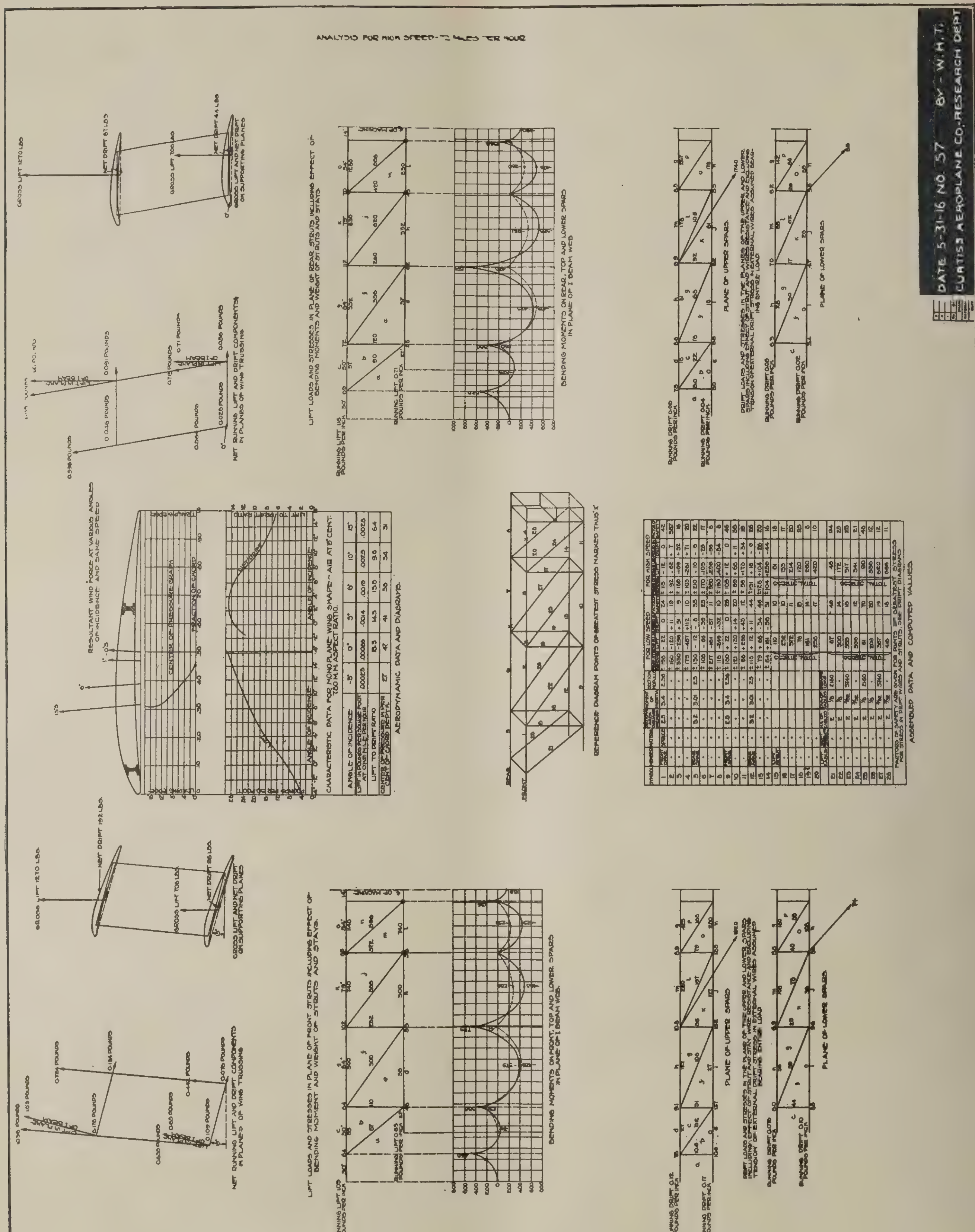
puted and measurements are made of the resistance and strength of the rivets or nails which secure the metal to the wooden propeller tip, and thus the factor of safety of the sheet metal tips is estimated. The Designing Department must furnish specifications for all the materials, such as woods, glues, and varnishes, used in the construction of propellers, and the character of finish to be given to the blades. It must also inspect and pass upon the propellers when they are finally completed.

The Indoor Propeller Testing Laboratory

Indoor tests, both static and running, are made on all the propellers before they leave the factory. Each propeller is mounted on a truly planed steel table and measured for pitch at many parts of each of its blades; then rotated to show where the blades track each other; then balanced on level steel ways to insure that the center of gravity lies on the axis of the propeller; then its blades are loaded on all its segments to determine the deflection and factor of safety. After the static test, the propeller is mounted on a motor



Testing instruments



A complete stress analysis is made of the wing framing of each type of machine made by the Curtiss Company. As shown in the above diagrams, the results are arranged on one sheet in convenient form, and consist of the following: 1. Shape of wing curve used, and its aerodynamic properties. 2. Diagram showing the lift and drift components in the planes of the wing trussing. 3. Diagrams of the wing framing showing the lift and drift stresses. 4. Diagram showing the bending moments in the wing spars. 5. A summary giving the area, moment of inertia, section modulus, stresses and factor of safety of each member of the wing framing. 6. A reference diagram to accompany the summary.

shaft and made to run at speeds considerably higher than it will have to endure in practice. During this run, the thrust is measured; the flutter, if any, is observed; the speed of rotation is noted, and opportunity is given the propeller to split, break, throw off its sheathing, or crack or heat at the hub. As a special inducement to throw off its sheathing, the propeller is sometimes run inside of a cabinet or a very close room, so as to increase abnormally the speed of rotation. At the close of the run a careful inspection is made to determine whether the propeller has suffered any damage. If the propeller be of an old type, its running test may last but a few minutes; if new, the test may last many days, or more than a week of eight hours per day, to be followed presently by long flights in the air.

The Outdoor Propeller Testing Laboratory

Outdoor propeller tests are of two kinds. First is the standing test on the roof of the factory or on the ground, where the air is free from the closed circulation experienced indoors. Next is the flying test in which the speed of climb or the speed of level flight on a straightaway course is carefully measured. In this test the condition of performance of the propeller and its speed of rotation are noted, and the main features of the aeroplane are observed and placed on record.

The Photographic Studio

For many years the Curtiss Company has made and preserved photographs showing the development of all its important devices and constructions, and as far as possible, the performance of its various types of aircraft. Both still photographs and moving picture reels have been found useful or necessary. Experience has shown that many important details of structural development which have escaped the memory of the entire force at the factory are clearly disclosed in the photographs. These, therefore, have an engineering as well as commercial and historical value.

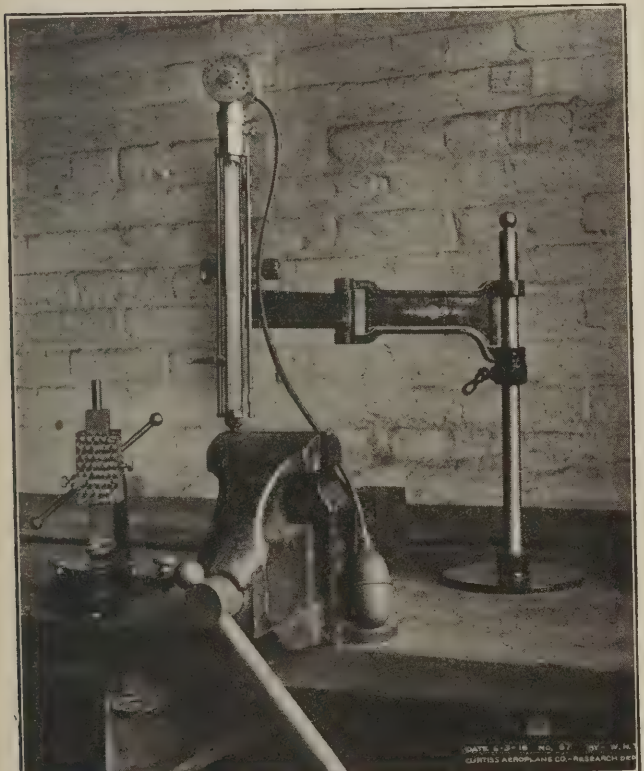
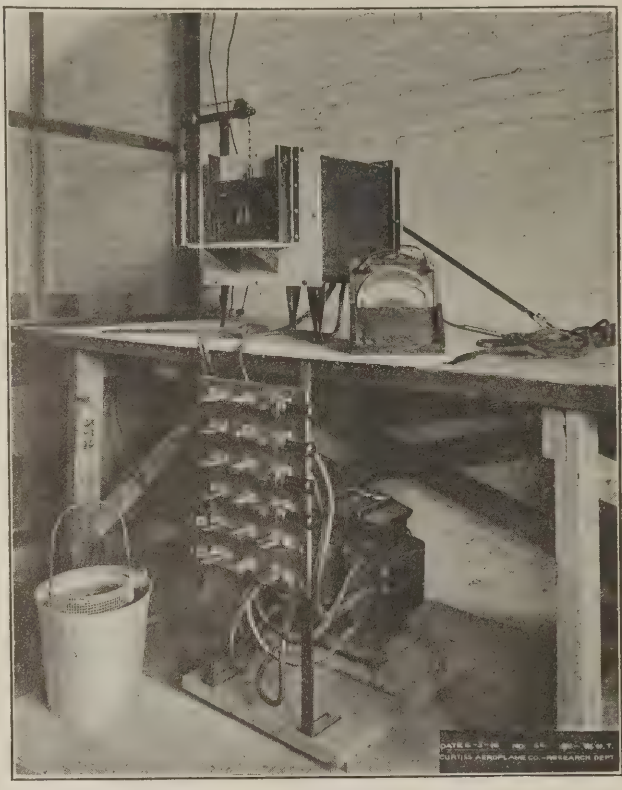


Illustration of a device for determining the relative hardness of various materials, known as the "Scleroscope."

The operation of testing consists of dropping a tiny hammer from a height of about 10″ onto the metal, hardened steel, etc., which it penetrates slightly. The hammer moves freely, yet snugly, within a glass tube, and weighs about 40 grains. Its striking point consists of an inserted diamond of rare cleavage formation, annealed sufficiently to withstand shocks. When the hammer strikes the metal, it reacts or rebounds. The height of this rebound is read on a graduated scale, and an accurate determination of the quantative hardness of the piece under test is obtained.

The hammer is raised to the top of the graduated tube by pressing the bulb and suddenly releasing the pressure. This sucks up the jeweled plunger hammer referred to, so that it may be caught by a hook which is suspended exactly central in the glass tube. The hammer is released from the hook by again pressing the bulb.

When small pieces are to be tested, the scleroscope self contained with its clamp and anvil, is employed. When the ends of rods, drills and many other tools are to be tested, they are clamped in a bench vise, and a swinging arm is employed; the instrument is removed from its post on the clamp frame.



This photograph shows a Hoskins electric furnace, which is used for experimental heat treating. The muffle is 7⅜″ wide, 5″ high, and 12½″ deep. The furnace is of the resistance type, and the current is regulated by a regulating transformer. By manipulation of the switchboard, the secondary voltage can be varied by steps of one volt, from one to 45 volts. This makes possible very accurate temperature regulations up to 2000° F. The furnace temperature is measured by a resistance-type pyrometer, the fire iron to which it is connected being inserted into the muffle at the back of the furnace. This furnace has been found to give very uniform heats.

Engine Testing Laboratory — Best Equipped in the World

The Engine Testing Laboratory was planned and equipped with a view to obtaining maximum utility, flexibility, and operating economy, no expense being spared in obtaining all essentials in quality and quantity and no waste being permitted in the purchase of useless instruments for public exhibition. It is not surprising, therefore, that this laboratory is far ahead of any other in completeness and in suitability for its purpose.

The main features consist of especially designed dynamometers and their appurtenances and in the wind tunnel which carries a blast of air over the engines under test and draws off the burnt gases.

There are two large dynamometers each of 300 H. P., rated capacity from 1,500 to 3,500 revolutions per minute and with standard overload ratings. This capacity and speed range is greater than is possessed by any previously built.

One of the large dynamometers is reserved for purely experimental work, the other is kept busy with 8-Hr. continuous full load tests on engines taken from regular production. All of these tests are controlled by the Engineering Department and serve for this department as a continuous accurate check on production.

A simple but valuable feature incorporated in these dynamometers is the extension of both ends of the shaft instead of only one as in former installations. It is well understood that the actual running time of the dynamometer is generally much less than the time during which it is tied up while the engine is being set up and while alterations or adjustments

are being made. The double end arrangement, therefore, actually doubles the over-all efficiency of the installation by permitting one engine to be set up and completely prepared for running while a test is in progress on another engine connected to the other end of the dynamometer shaft.

The centralized control of the dynamometer and engine is arranged on and at the side of the observer's desk so that he may control the engine, dynamometer and the cooling water temperature, and observe the tachometer, dynamometer scales, gasoline flow, inlet water temperature and oil pressure and temperature without leaving his position. Observations of all these readings are recorded during continuous tests every 10 minutes. In addition the inlet water temperature and the continuous revolution counter readings are recorded every 10 minutes and the gasoline and oil used are accurately measured and recorded.

While an engine is being tested on one end of the dynamometer another is being set up at the other end. The special test plates, engine support pedestals and gasoline support column are so arranged that all connections, except the water inlet and outlet, can be completed beforehand and moved up with the engine. Special machined longitudinal slots in the base plates engage tongues on the engine support pedestals so that the engine and connections can be moved toward or away from the dynamometer without disturbing the alignment. It might be here noted that the current from the dynamometer is used to drive the fan in the wind tunnel and that for continuous tests the dynamometers are arranged to be self-exciting so as to be independent of the motor generator and to free the motor generator for other uses.

The wind tunnel contains a 5-ft. exhaust fan driven by a 20 H. P. motor. It has one outlet to the roof and four inlets, one from over each of the engine test plates. Dampers control the inlets so that any or all may be closed at will. After the engine is connected to the dynamometer ready to run it is enclosed in a restricted sheet metal tunnel and sheet metal panels are hung from the rim of the main tunnel inlet in such a manner that all the air drawn to the exhaust fan must pass close to the engine through the restricted tunnel. This gives sufficient cooling effect for an 8-Hr. continuous test, though not nearly so much as the engine receives in flight.

Before each 8-Hr. test the valve and spark timing of the engine and the compression pressures in each cylinder are measured.

After the 8-Hr. test the engine is completely disassembled, inspected, reassembled, given a half hour run with its propeller, cleaned, mounted in its fuselage and given a 15-minute run to check the oil and water connections, wiring, etc. The engine is then shipped in the fuselage and is ready to start without any alterations upon arriving at its destination.

The following list will give some idea of the completeness and simplicity of the total equipment:

2—Special L.C.-70, 300 H. P. Sprague electric dynamometers, speed limit 3,500 r.p.m., each equipped with:

- Standard switchboard and special control panel
- Iron grid resistances
- Chattilon beam scales
- Chattilon spring scales
- Motoring attachment
- Special electric tachometer
- Special electrically operated Veeder revolution counter
- S. & B. continuous rotary revolution counter
- Gasoline metering apparatus.

2—Special engine base plates, each with its own set of special universally adjustable rigid engine support pedestals.

1—Water barrel with double circulating system and stationary thermometers takes care of the engine set upon either end of the dynamometer.

1—Special L.C. dynamometer 7½ H. P. with motoring speed range from 100 to 4,000 r.p.m.

1—40 H. P. motor generator and switchboard to furnish direct current to the dynamometers and auxiliary apparatus.

1—5-ft. exhaust fan with 20 H. P. D. C. motor and with exhaust duct and hoods to furnish a draft of air past the engines and to carry off the exhaust gases.

2—Dr. Horn system—3-speed hand tachometers.

1—Tycos standard mercurial barometer.

1—Tycos Hygrodeik.

1—Crosby standard test gauge.

Assorted pressure and vacuum gauges for measuring oil and water pressures, draft, etc.

1—Crosby gauge tester—plunger type.

2—Aeroplane fuselages for testing engine and propeller assemblies.

Miscellaneous

Platform scales, balances, traction dynamometers, stop watches, microscopes, micrometers, dial test indicators, hand revolution counters, thermometers, etc., also photographic apparatus with dark room and special apparatus for determining valve and spark timing, compression pressures, compression volumes, etc.

APPARATUS FOR TESTING STEEL OR WOOD AILERON CONTROL BRACES UNDER ACTUAL CONDITIONS.

The control brace is fastened with screws at the middle of the heavy rectangular beam, one end of which is placed upon a knife edge blocked up from the floor; the opposite end is placed upon a knife edge at the same height; the whole resting upon a large platform scale. Two steel aviator wires are fastened to the control brace and anchored to the floor; these wires limit the forward movement of the brace. Opposite the wires, is fastened a stranded cable and a large turnbuckle, which in turn are fastened to the floor. By means of the turnbuckle, pull is applied at the cable, the load being transmitted to the scale thru the lever arm of the beam. By taking moments about the control brace, knowing the weight exerted on the scale end, the upward thrust which the control brace must exert can be readily computed.

DYNAMICAL STABILITY OF AEROPLANES

By Jerome C. Hunsaker, Eng. D.

Assistant Naval Constructor, U. S. Navy, Instructor in Aeronautical Engineering, Massachusetts Institute of Technology
Assisted by T. H. Huff, S. B. D., D. W. Douglas, S. B., H. K. Chow, S. M., and V. E. Clark, Captain U. S. Army

PART I. LONGITUDINAL MOTION

§1. INTRODUCTION AND CONCLUSIONS

The present dynamical investigation of the stability of motion of aeroplanes is based upon the well-known theory of small oscillations of rigid dynamics as first applied by Bryan to aeroplanes and extended by Bairstow. The necessary coefficients for use in the equations of motion were determined by model tests in the wind tunnel of the Massachusetts Institute of Technology.

The application of model experiments to predict the performance of full-size aeroplanes is now so well established that no general discussion of the theory of models is undertaken. A great part of the actual experimental work was performed by Messrs. Huff and Douglas. The oscillating apparatus was designed by Mr. Chow under the direction of Professor E. B. Wilson, of the Department of Mathematics. Captain V. E. Clark, U. S. A,. while a student in aeronautical engineering, designed an aeroplane which was selected as one type for investigation.

It is necessary to acknowledge the cordial interest taken in the work by Professor C. H. Peabody, head of the Department of Naval Architecture. From the beginning of aeronautical research in his department, Professor Peabody has offered the warmest encouragement by countless arrangements to facilitate progress and to prevent interruptions.

Following the analysis of Clark's aeroplane, the work was repeated for a model of a military aeroplane known as Curtiss JN2. The Curtiss Aeroplane Company gave their full co-operation with a desire to learn what improvements in the design might be suggested by our stability calculations. Dr. A. F. Zahm, of the research department of that company, made careful tests to locate the center of gravity and to determine the moments of inertia of the actual aeroplane.

The Curtiss machine is a practical aeroplane with powerful controls, which does not pretend to possess any particular degree of stability. The Clark aeroplane, on the other hand, was designed to be inherently stable while departing as little as possible from the lines of the ordinary military aeroplane as typified by the Curtiss JN2.

The comparison of these two aeroplanes is interesting and leads to the conclusion that inherent dynamical stability, both longitudinal and lateral, may be secured in an aeroplane of current type by careful adjustment of its surfaces and without material effect on controllability or performance.

The discussion in detail is confined to the Clark model, for brevity of presentation, and the results only of the parallel calculations for the Curtiss model are introduced where a comparison is suggested.

In Part I the general equations of motion are deduced in a simplified form which applies to horizontal flight in still air. The longitudinal motion is then considered separately and the necessary aerodynamical constants determined from wind tunnel tests. It is found that the longitudinal motion, if disturbed by any accidental cause, is a slow undulation involving a rising and sinking of the aeroplane as well as a pitching motion. This undulation is stable for high aeroplane speeds since it is rapidly damped out. At lower speeds, the undulation is less heavily damped until at a certain critical low speed the damping vanishes. For speeds below this critical speed, the undulations tend to increase in amplitude with each swing and the longitudinal motion is, therefore, unstable.

Similar calculations for the Curtiss aeroplane show a similar critical speed below which the longitudinal motion is unstable. It is believed that the existence of instability at low speeds has not been indicated before, and it is hoped that the recommendations made to reduce the critical speed may be of assistance to designers.

It appears a simple matter to secure any desired degree of longitudinal stability by the use of properly inclined tail surface, and by the use of light wing loading. It is pointed out that excessive *statical* stability, as indicated by strong restoring moments, is undesirable and may cause the motion to become violent in gusty air. This violence of motion may seriously impair the pilot's control and the aeroplane may "take charge" at a critical time.

However, the longitudinal motion for any particular speed of flight may be made dynamically stable, while at the same time only slightly stable in the static sense, by the use of a large tail surface which lies very nearly in the relative wind. If the minimum of statical stability be combined with the maximum of damping, the pitching will be very slow and heavly damped. The longitudinal motion can then be dynamically stable and yet be without violence of motion in gusty air.

The general prejudice among pilots against "very stable" aeroplanes is believed to be justified. It cannot be too strongly insisted upon that true dynamical stability is better given by damping than by stiffness.

Experience with rolling of vessels has led to the design of vessels of small metacentric height (a measure of statical stability) fitted with generous bilge-keels (damping surface) for passenger carrying. An effort is made to get away from the violence of motion associated with stiffness.

In Part II, the lateral or asymmetrical motion is investigated. The necessary aerodynamical constants are determined by wind tunnel tests wherever practicable and two coefficients which cannot readily be found experimentally are calculated by a simple approximate method. The character of the motion as indicated by the solution of the determinant formed from the equations is then discussed.

It is found that the lateral motion is a combination of a roll, yaw, and side slip or "skidding." Using approximate methods, the combined motion is resolved into three components, two of which are important.

One type of motion is a spiral subsidence if stable or divergence if unstable. The Clark aeroplane becomes spirally unstable at low speed. The motion is a "spiral dive" due to an overbank and a side slip inwards. The aeroplane makes a rapid turn with rapidly increasing bank accompanied by side slipping inwards. The instability is such that an initial deviation from course will double itself in about 7 seconds.

It is shown that the spiral motion may be made stable by adequate fin surface above the center of gravity or upturned wings and by reduction in "weather helm" due to too much rudder or fin surface aft.

The Curtiss aeroplane shows the same sort of spiral instability at high speeds. This aeroplane had no dihedral angle of wings and had a large rudder and deep body.

The second type of motion has been called a "Dutch roll" from analogy to a figure in ice skating. The aeroplane takes up an oscillation in yaw and roll simultaneously. It swings to the right banking for a right turn, then swings back to the left banking for a left turn. The combined yaw and roll has a fairly rapid period. The Clark model at all speeds shows that this motion is heavily damped and hence stable. At high speed, the period is 6 seconds and an initial amplitude is damped to half value in less than 2 seconds. At low speed the period is 12 seconds, damped to half amplitude in 6 seconds.

It appears from an approximate calculation that the "Dutch roll" may become unstable if an aeroplane has too much high fin surface and if there be not sufficient "weather helm" or rear fin surface. It is seen that these conditions are the reverse of those for spiral instability. The conflicting nature of the requirements for stability in these two kinds of motion suggests that an aeroplane is unlikely ever to be unstable in each sense. It also indicates the difficulty of obtaining lateral stability by raised wing tips.

In confirmation of theory, we found the Curtiss spirally unstable at high speed and stable in the "Dutch roll," while at low speed the spiral motion was stable and the "Dutch roll" unstable. The period was 6 seconds and an initial amplitude doubled itself in 8 seconds.

It is believed that the majority of modern aeroplanes of ordinary type are spirally unstable because of excess of fin surface aft. When attempts have been made to remedy this fault by use of a large dihedral angle upwards for the wings, matters have been made worse. It is only to be expected that in overcorrecting spiral instability a "Dutch roll" of more or less violence may be introduced. Especially in gusty air would one expect high fin surface to produce violent rolling.

The Clark aeroplane has very slight rise of wings, about 1.6°, and a small rudder. It is shown that at ordinary speeds this aeroplane is stable in every sense, both longitudinally and laterally. Whether this stability is excessive can only be determined by actual flight experience in turbulent air. However, it has appeared possible to secure a degree of stability in every sense in an aeroplane of conventional type.

The object of the research has been to show how various features of design may affect the motion of the aeroplane and only incidentally to produce a stable aeroplane. The discussion has been confined to motion in still air. If an aeroplane be unstable in still air it is obviously worse off in gusts. The converse is, unfortunately, not true, for an aeroplane which is very stable in still air may be so stiff that in turbulent air it will be violently tossed about.

It is conservative to conclude that aeroplanes should not be unstable and that they need not be, since slight changes in the nature of adjustments suffice to correct such instability of motion.

In view of the military use of aeroplanes inside the zone of fire the probability of controls becoming inoperative is ever present. An inherently stable aeroplane, with controls abandoned or shot away, could still be operated by a skillful pilot by manipulation of the motor power alone.

Any sort of automatic (or gyroscopic) stabilizer which operates on the controls is of no use when those controls fail, and it should be judged as an accessory to assist a pilot rather than as a cure-all for the inherent instability of an aeroplane's motion.

The ordinary type of aeroplane readily lends itself to adjustments which make for inherent stability of motion and there is no reason to seek radical changes of type to insure stability. Freak aeroplanes of great "stability" may be excessively stable in some ways and frankly unstable in others. It is likely that the most satisfactory aeroplane will be only slightly stable and that this aeroplane will in any possible attitude be easily controlled by the pilot.

Controllability and statical stability are to some extent incompatible. Dynamical stability requires some amount of statical stability and considerable damping. It appears to be of advantage to provide the minimum of statical stability and the maximum of damping. Then the aeroplane's motion will be of very long period but heavily damped.

It is believed that the methods of investigation here described may be applied to any type of aeroplane, and, by the systematic variation of one feature of design at a time, a full understanding may be had of the effect on the motion of each change. The process is of necessity laborious, but compared with the difficulty of full-scale experiment in the open air, the model method is rapid and inexpensive. It is rarely possible in actual flying to obtain any idea of the effect of slight changes in design. Weather conditions, motor troubles, personal peculiarities of pilots, etc., tend to add to the complexity of an otherwise very simple problem.

Furthermore, experimental flying is dangerous. For example, I knew a pilot who, to determine whether a new aeroplane was spirally unstable, took his machine up to a good altitude and allowed it to get into a spiral dive. The machine made five turns of a rapidly winding and contracting helix before he could bring it out on a horizontal path. If the controls had been only a little less powerful the machine would surely have crashed to the ground. That the controls were adequate was purely a matter of good fortune. The experiment was a success in that spiral instability was demonstrated. Only a few minutes of time was required. However, no information was obtained as to the degree of instability present nor as to what particular changes would remedy matters. To complete the experiment, it would be necessary to repeat the dangerous feat for every change which suggested itself. Naturally, a designer will be very economical in his suggestions under such conditions.

§2. TYPE DESIGN

The type aeroplane selected for the first investigation is a two-place biplane tractor designed by Captain V. E. Clark, U. S. A., while a student in the graduate course in aeronautical engineering at the Massachusetts Institute of Technology. This aeroplane is considered to be representative of modern practice in aeroplane design. Its principal dimensions are as follows:

Wing area, including ailerons	464	sq. ft.
Span, feet	41	max., 40.2 mean.
Aspect ratio	7	
Gap	6.37	ft.
Dihedral of wings, degrees	176.75	
Area, stabilizer	16.1	sq. ft.
Area, elevators	16.0	sq. ft.
Area, rudder	9.35	sq. ft.
Length, body	24.5	ft.
Depth, body, maximum	3.2	ft.
Width, body, maximum	3.3	ft.
Weight, bare	1,070	lbs.
Weight, personnel	320	lbs.
Weight, fuel and oil	415	lbs.
Weight, full load	1,805	lbs.
Radii of gyration	5.2	ft., in roll.
	4.65	ft., in pitch
	6.975	ft., in yaw.
Brake horsepower	110	
Fuel and oil per B. H. P., hour	0.73	lb.
Maximum speed	87	miles per hour.
Minimum speed	35	miles per hour.
Initial rate of climb	900	ft. per min.
Best glide	1 in 9	
Endurance, full power	5.6	hours.
Endurance, reduced power, 14 hours at	47	miles per hour.

§3. MODEL

A model, $\frac{1}{26}$ scale, was made by Edward Tighe, model maker, giving a span of 1.58 feet. The size of the model was limited by the size of the wind tunnel which is 16 square feet in section. The model is shown in figure 1 (see pp. 8 and 9). Note that wires are omitted and struts are made round instead of "stream line" in section. It is believed that the effects of these changes on total resistance largely counterbalance each other. This model was carefully shellacked and polished to minimize skin friction. The model is, of course, much more smooth than the full-size aeroplane, as it should be, in order that the surfaces may remain geometrically similar. Model work was to the nearest hundredth of an inch. No propeller was fitted, but in the design account was taken of the propeller race in augmenting resistance.

For simplicity, the model was made with trailing ailerons or wing flaps integral with the wings. This somewhat increases the effective supporting area. The stabilizer and elevator were made in one, corresponding to the elevator flaps in neutral position. These points are made clear on figure 1.

§4. WING COEFFICIENTS

In the course of the design, a wing section was devised by Clark which showed a low resistance at high speed and small angle of attack and at the same time was thick enough to permit the use of robust wing spars. A model of this wing was made, of 18 inches span by 3 inches chord, and tested in the wind tunnel. For various angles of wing chord to wind, the lift L, drift D in pounds, and pitching moment M in pounds-inches were observed for a wind of 30 miles per hour; air of density .07608 pound per cubic foot.

The wind tunnel and balance are duplicates of the 4-foot installation at the National Physical Laboratory, England, and reference may be made to the technical report of the Advisory Committee for Aeronautics, year 1912-13, for a description of the apparatus and method of operation.

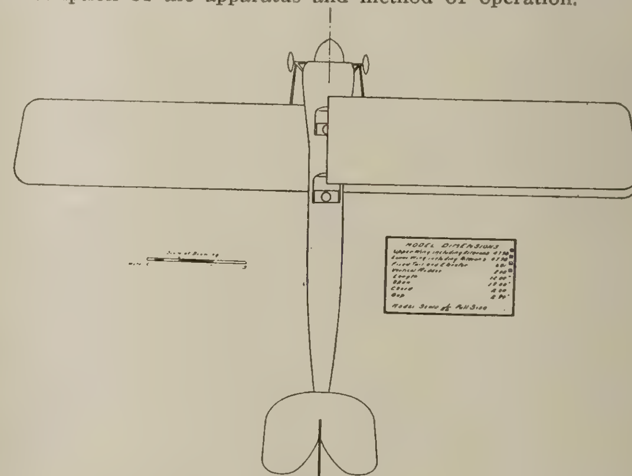


FIG. 1A.

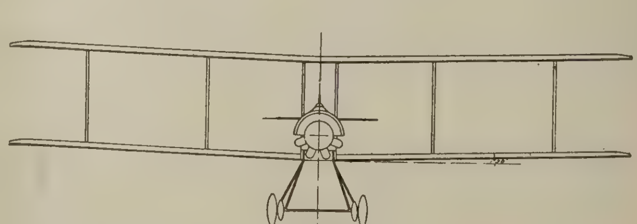


FIG. 1B.

(*To be continued*)

FOREIGN NEWS

FRANCE

The following is from the official bulletin of July 10th:

"Our aviators attacked a number of German machines yesterday in the region of the Somme. Four of the enemy aircraft were driven down within their own lines. Last night one of our air squadrons threw a number of shells on the railroad stations at Ham and Polaincourt."

Several members of the American aviation squadron made a sortie over the German lines on July 9. Corporal Dudley Hill, of Peekskill, N. Y., and Sergt. Kiffin Rockwell attacked a German observation machine. Prince joined the combat, and an aviatik flew to the support of its comrade, which eventually was forced to descend within the German lines, whereupon the aviator quickly quit the fight.

All the machines of the American aviators have holes shot in their planes as a result of the battle. One bullet hole in Rockwell's machine showed that a bullet had passed within an inch of the American's breast.

Lufbery simultaneously had a brush with the famous German aviator Boelke, who has been reported killed—erroneously it would seem—who can always be recognized by his black machine decorated with white. After several volleys had been exchanged Capt. Boelke quit.

Lieut. William Thaw visited the squadron on July 10, and although he is not yet fully recovered from his recent wound, flew over the German lines.

Lawrence Scanlon, of Cedarhurst, L. I., who has been at the Hospital Francaise de New York, near Sens, since last fall, following a wound received while fighting with the Foreign Legion, has been decorated with the War Cross.

GERMANY

A correspondent of the Konigsberger Hartungschen Zeitung, who is on the Russian front, writes that the German troops are constantly harassed by Russian aviators. He writes:

"The activity of the Russian aviators has increased greatly lately. Early in the morning these unwelcome Russian guests make their appearance, as then our positions are readily visible. There is little sleep for us after dawn, as our batteries are kept busy firing at them. We closely follow every movement they make, but thus far we have not been fortunate enough to bring any one of them down.

"One morning an amusing incident occurred. A Russian aviator was again over our lines and very cleverly he eluded our shrapnel fire. Suddenly to the left one of us spied three more aviators, and they at once attracted all of our attention. They flew about in most graceful curves and we all admired their apparent skill in controlling their machines. Then one was seen to ascend over the other two. Ha, he is going to throw down bombs! We were convinced that he was a Russian attacking the two German machines below him. The three looked like mere specks now. In fact, they were gradually vanishing in the morning blue when one of our companions came with a field glass. He looks and then hands me the glass. One glance and I laugh out loud, in which my companions heartily join. The aviators no longer interest us, for they were only storks.

"We say nothing, but are amused to watch the other men of our battalion still observing these 'aviators.' No doubt they will look in vain in the official report of that day for some mention of this battle in the air and the defeat of a Russian airman. Strange that even storks can fool us so easily."

On July 10 the German official report was as follows:

"There was very lively aerial activity on both sides. Our aviators shot down five enemy aeroplanes, one near Nieuport, near Cambrai, two near Bapaume and two captive balloons, one on the Somme and the other on the Meuse."

Senior Lieuts. Wallz and Gerliet have put out of action their fourth opponent, Lieut. Lefler his fifth and Lieut. Parschau his eighth. The Emperor has bestowed upon the last named the Order Pour le Merite.

There is a scheme on foot in Germany for the formation of a "Transatlantic Zeppelin Freight and Passenger Service." The first airship, one of the new type of super-Zeppelins, will arrive at an American port some time in the middle of August if the plans materialize. Its name will be "Z-Deutschland," and it will carry a large cargo of dyes and chemicals, mails, and possibly some passengers.

The following is from the official report of July 13:

"An English biplane was compelled to land within our lines near Athies, south of Peronne. An enemy aeroplane fell to earth near Soyecourt. Another was brought down by our anti-aircraft guns near Chattancourt. In the vicinity of Dombasle, west of the Meuse, a captive balloon was shot down by our airmen."

All reports indicate that the struggle for mastery of the air on the west front has reached a pitch of intensity unprecedented during the war. Since the beginning of the Somme battle the French and English are employing swarms of fighting aeroplanes to break up the German aerial reconnaissance, which is greatly favored by the terrain, as the enemy's troop movements and drawing together of huge masses of ammunition supplies are easily spotted by German fliers on the rolling plain of Picardy with its many little villages and lack of woods.

Germans praise the undeniable daring of enemy fliers, which is proved by the extraordinary number of twenty-two shot down behind the German front, but they contend that the Fokker fliers have established new records of superiority over enemy fighting aeroplanes in a ratio exceeding two to one. Air battles are being fought with increasing frequency, not only among men at the front, but far to the rear, as a result of the French and English air raids on German lines of communication. Every night last week on which weather conditions permitted enemy squadrons were in action, trying to drop bombs on railways, bridges, and spots behind the German front, the short bright June nights particularly favoring these excursions. Early dawn has been a favorite time for enemy squadrons to drop bombs.

Eyewitnesses describe these squadrons as sailing in close formation on the straightest possible course toward their goal. Most of the aeroplanes are loaded with bombs and convoyed by fighting aeroplanes to keep off the German Fokker fighters. Under way, the enemy fliers generally divide into small groups, and after finishing their job return homeward singly. German correspondents, however, unanimously report that little serious damage so far has been inflicted by these continuous night raids.

GREAT BRITAIN

No one was injured and no damage done excepting that a few windows were broken in the first two raids on the coast of England by German aeroplanes on July 9th, the War Office announced on July 10th.

The first raider was chased away before he could drop bombs. The second German aeroplane that appeared off the coast before midnight dropped seven explosive bombs and escaped.

The following is from the official report for July 10th:

"Yesterday the Royal Flying Corps operated several successful bombing attacks against various detraining centers, ammunition depots and aerodromes. Numerous combats occurred in the air, as a result of which one German aeroplane was destroyed and several others were driven to the ground in a damaged condition."

General Haig reported on July 13th that despite unfavorable weather aeroplanes on both sides were very active. Several hostile machines were drivn off. A British machine failed to return after one of these combats.

ITALY

The following is the official Italian report for July 13:

"Hostile aircraft dropped bombs on Latisana, causing a fire, which was extinguished quickly. Our air squadrons on July 10 bombarded Tione, in the Giudicaria Valley, and on July 11 the enemy's camps at Monte Rover, northeast of Lavarone. Our aeroplanes returned safely."

One of the De Haviland scouts at the Hendon flying field.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
47 Churchill St., Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Motors for Model Aeroplanes

Gasoline Motors

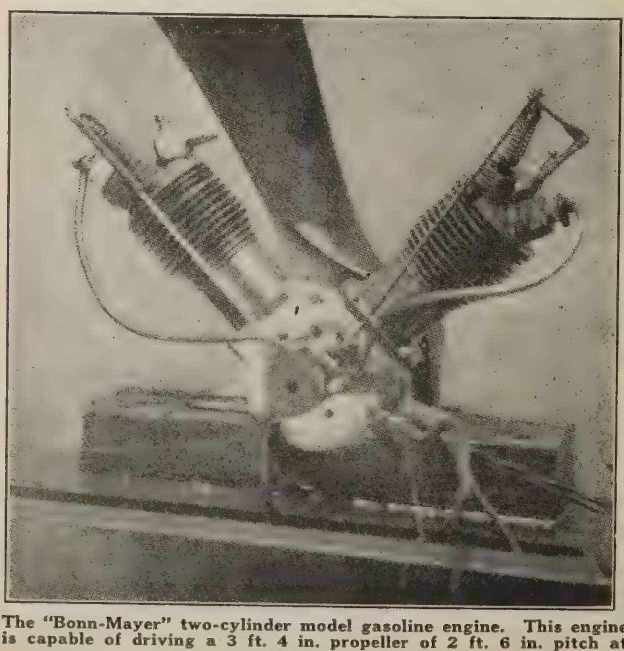
(*Continued from page* 484)

It would appear at first sight that in this engine must lie the true solution of the model aeroplane engine. It is an engine of this kind which has solved the problem of aerial locomotion as applied to full-sized machines; and if in the case of full-sized machines, then why not models? The size of the smallest *working* model steam motor is amazingly small; not so the gasoline engine—not one, that is, that will work. The number of gasoline driven model aeroplanes that have actually flown is surprisingly small. The one constructed by Messrs. J. Bonn & Co (photograph herewith) is worthy of note. In this case the power developed was 1½ h.p. at 1,500 r.p.m., and the total weight 36 to 45 lbs., according as to how the model was fitted with plane, etc.

Another gasoline engine with which we are personally acquainted has a two-cylinder engine, power developed 1 h.p. (rather more, in fact), total weight of the model 16 lbs. This model has, however, never been tried in actual flight, but we believe it would fly.

So far as we can learn, we only know of one single cylinder engine that has been made to work satisfactorily and this will be described in a subsequent issue. The question of vibration with this type of engine is a very serious one; even a badly-balanced propeller will seriously interfere with and curtail the length of flight, to say nothing of shaking loose on the model everything that can be so affected.

Another point to carefully note in the case of the gasoline engines is that it is mostly those of from 1 to 1½ h.p. that have met with any success, although the single-cylinder engine is rated at ½ h.p. If this be so, then, so far as a motor for model aeroplanes in anything at all approaching a general use, the gasoline engine offers many possibilities.



The "Bonn-Mayer" two-cylinder model gasoline engine. This engine is capable of driving a 3 ft. 4 in. propeller of 2 ft. 6 in. pitch at 1,200 r.p.m.

For large models weighing, say, from some 20 lbs. upwards, this engine can no doubt be successfully applied, and one such model might with great advantage be owned by the larger and more important model clubs, and kept by them for experimental and research purposes. There are difficulties to be overcome in such a scheme, no doubt, but they are certainly not insuperable; and it would, or should, prove a bond of common interest to the club, which individually owned models with propelling power supplied by gasoline engines.

Referring to model aeroplane engines generally, what the aeromodellist wants to know is *not* some hypothetical h.p. at so many assumed r.p.m., and some unkown pressure which the generating plant may never realize—or if it actually does so, its duration may only be some 5 seconds, but the following items:—(1) What is the *total* weight of the whole necessary plant (generator, fuel, engine, &c.)? (2) What actual propeller-thrust, will such a plant give? (3) The duration of such a thrust, and the time during which such is constant, and the manner in which it falls off. Knowing these, it remains to calculate or estimate the approximate weight of the planes, fuselage, chassis, &c., to carry the plant; and if we find (to take a concrete case) that the static thrust of the propeller is 1 lb., the weight of the entire plant 2 lbs., and the total weight of everything 4 lbs., then such a model should most certainly fly. If the total weight is only 3 lbs., then the model should fly well and high; if 5 lbs., the model may fly if the aerofoil surfaces are very efficient, but the model will (probably) not be a self-rising one.

(*To be continued*)

Illinois Model Aero Club

By Romaine H. Boulton

The results of the R. O. G. contest are: A club average of 83 7/10 sec. with Pease, 140 4/5 sec., first; Cook, 130 2/5 sec., second, and Hall, 114 sec., third.

The elimination trials were held and a team selected for the Hydro contest.

The first Hydro meet of the National Model Aeroplane Competition will be held at Mr. Dickinson's Hydro landing station at Lake Calumet, July 16th.

Emil Laird, former president of the club, filled a loop date at Butte, Montana, on the 4th.

Mr. Wells is making daily flights in his tractor biplane.

Mr. Arenes informs us that he will have his 35 Anzani tractor at the field next Sunday.

At a meeting held at the A. C. I. clubrooms to form a central aviation reserve, 20 of the model club members volunteered.

Art. Nealy is touring the Eastern States, visiting the various aeroplane factories. He informs the club that he is using his fliver.

Mr. Cook has left for a visit to his father's ranch in Kansas.

Mr. Hitt has left for Oklahoma. Mr. Lucas, vice-president, will act as president during his absence.

The Aero Science Club of America

Mr. Carter Tiffiny has informed the Club of his intention of joining the Curtiss Aviation School at Buffalo, New York, in the very near future. For a number of years Mr. Tiffiny was an active member of the Summit Model Aero Club. The best wishes of the Club are with Mr. Tiffiny.

At a recent contest held at Garden City Flying Field Mr. Frank Schober succeeded in getting his compressed air driven model to fly a distance of 432 feet. This flight is official, in as much as Mr. Edward Durant, Director of the Club, and Mr. H. W. Ross, of Flying Magazine, were present and witnessed the flight. Photographs and description of this model will appear in a subsequent issue.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials cf contributor will be printed when requested.

A Call Down

"Listen; it's airy verse:
Johnny in his aeroplane,
Said, "I'll sail the sky,
Hi! hi! I'll have a high old time.
high."
on
up
me
hie
I'll
But Johnny married (as men will)
Hypatia, known as Hy.
She had a temper like her name
And fire in her eye.
She made John sell his aeroplane—
He feared Hypatia so;
He ne'er again will soar the sky—
He's
feeling
awful
low."

"What are the duties of the American soldiers in Mexico?"

"If the press dispatches can be relied upon, a day's work consists of hunting for Villa one hour, hunting for water five hours, and the rest of the time hunting for lost American aviators."

"Yes," said the aviation enthusiast, "I expect to go to Washington and raise my voice in support of aeronautics for the Army."

"Never mind raising your voice," said the other fellow; "stay here and raise funds."

Terse Terms

Slone—I hear they call Mire's flying machine a lover's machine.

Loan—Why so?

Slone—Its two cylinders beat as one!

Warned

"You say you are a pacifist?" asked an aero manufacturer.

"Yes," replied the indignant person, "and let me tell you, sir——"

"Hold on a minute."

"Well?"

"If you are pacifist, don't shake your fist at me."

He Knew

Visitor (to aeronautical enthusiast in one of New York's libraries)—Do you know where I can find Lincoln's Gettysburg address?

Enthusiast—Just send it to Gettysburg and he'll probably get it all right.—*Jack-o'-Lantern.*

A Sociable Chap

An aviator who has traveled throughout the United States filling exhibition dates relates the following conversation which he overheard while in Washington.

There entered a Washington shop a dusky person who announced that he wished to purchase a razor.

"Safety?" asked the clerk.

"No, suh," was the decided response, "I desires it fo' social usage."

Speaking about our big guns, Curtiss, Martin, and the Wrights are air-guns.

After the Meet

"How did you get that stitch in your side?"

"Oh, I got hemmed in a crowd."—*Lampoon.*

True love is like an aeroplane—uplifting—and then you fall hard!

"Good morning; have you used Pear's soap?"

"No; I'm not rooming with Pear any more."

So It Goes

"Jimson mortgaged his house to buy an aeroplane."

"Yes, and now he's got to mortgage the aeroplane to buy gasoline."

Good Reason

"Aren't you ever worried when you're way up there in the clouds?" was asked the daredevil aviator.

"I always am," he replied. "I never can tell until I get down but what my manager has beat it with the gate receipts."

Did you hear that loud report?
Just as we reached the scene
A wind blew through the office
And blew up our magazine.

Help Needed

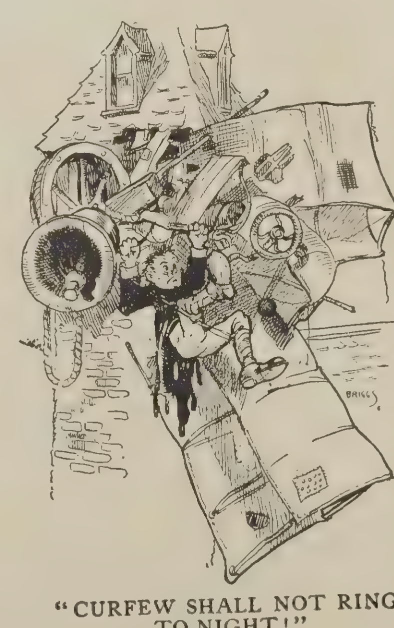
O'Hoolahan—"Casey is that sthrong he can raise a barrel ov flour right over his head."

O'Rourke—"Sure, that must be some ov that self-raisin' flour."

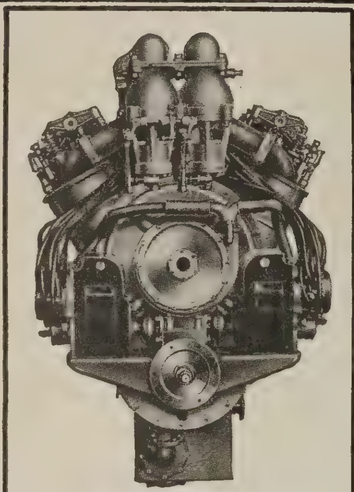
Fierce Fluids

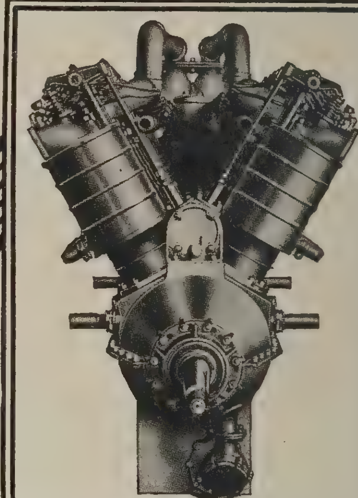
"What made the trouble for the original inhabitants of America was firewater."

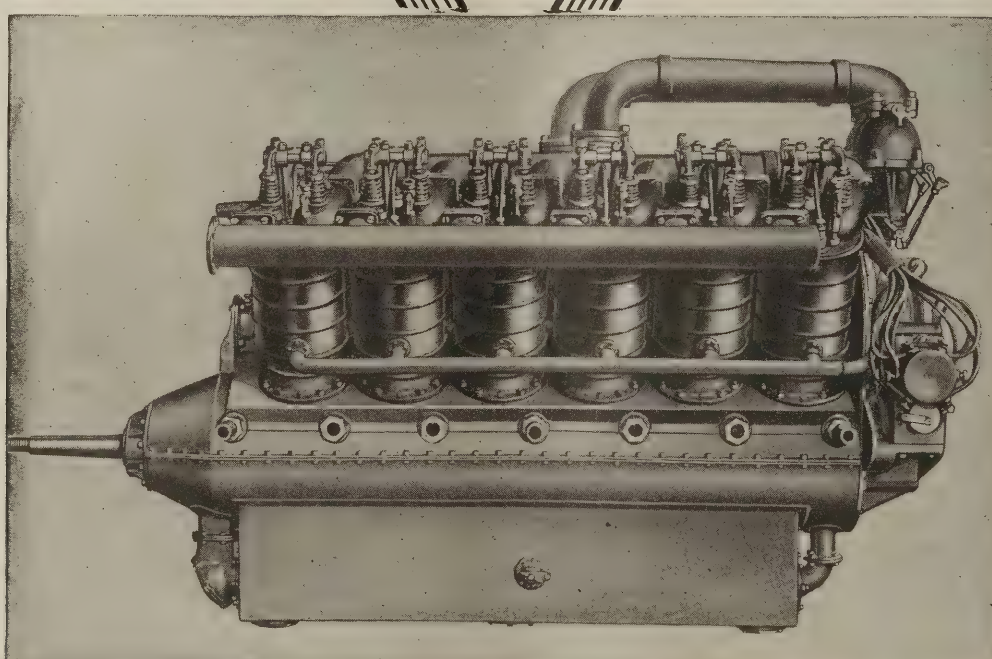
"Yes," replied Mr. Chuggins, "and what is making the trouble for the modern inhabitants is gasoline."



"CURFEW SHALL NOT RING TO-NIGHT!"







Plans 30-Hour Trip to London

To make transatlantic flights to London in thirty hours by aircraft, passengers to be taken if any can be found to brave the perils if midair, is what the promoters of the American Aircraft Company say they can accomplish. Their office at 120 Broadway contains an elaborate set of plans for an aircraft designed by Frank Dupree, president of the new company. Dupree is a practical aeronaut, who has flying records to his credit, and the machine he has designed is the fruit of his experience in the air. The officers of the company, besides president, are H. L. McNair, an attorney, secretary and treasurer.

It is said the keel for the first airship will be laid within a month, and that as soon as it is ready Dupree is prepared to pilot it across himself, with or without passengers. The machine will cost $110,000 to build. It will carry four 300-horsepower engines, one of which alone would be capable of running the machine if all the others should fail.

A Prophecy

Shortly after the close of the European war, whenever that may be, residents of New York or some other city along the Atlantic Coast will be surprised to see a big aeroplane sailing into port from Europe. This is the prophecy of Lieut. Marinus van Meel, of Rotterdam, retired, who was the head of the Holland aviation corps until recently. Lieut. van Meel holds the altitude record for Holland and has a reputation in Europe as one of the most skillful and daring aviators abroad.

"It's a sure thing, in my opinion, that it will be only a short time until an aeroplane will cross the ocean," said Lieut. van Meel, at the Willard. "And the aeroplane will be coming this way. I do not look for an American machine to cross the ocean first. Developments in the European war in aviation have been almost beyond comprehension. The world will not know what wonderful progress has been made until the war is over, for in the midst of the terrible struggle there has not been time to give publicity to the various great achievements. There is no doubt that since the beginning of the war greater progress has been made in the development of the aeroplane than in all the years preceding from the time the Wrights first demonstrated air flights to be practical.

"In the beginning of the war the French showed themselves the most proficient in aviation, but the Germans have learned a great deal and now there is little to choose between the French and Germans. The British have been behind both France and Germany—and America, poor America—is lagging far in the rear of all the nations of the world.

"I think it has been proven that the dirigible is useful for only a few purposes in war. It is not the great engine it was thought to be in the beginning."

Personal Paragraphs

J. C. Irvine, president of the Pacific Aero Club, and Guy T. Slaughter, vice-president of the club, are taking an active part in the mobilization of aviators on the Pacific Coast.

Walter J. Carr, of Spring Valley, Illinois, who has been making exhibition flights in Illinois, has volunteered his services as an aviator on the Mexican border.

Frank Bryant, the instructor of the Christofferson Aviation School, made several excellent flights at Maricopa on July 4.

Sergeant Milton S. Beal, of Troop B, came all the way from Garden City, L. I., to Columbus, Ohio, to answer the militia call. Beal is a licensed aviator, having taken a course in flying at the Wright School at Augusta, Ga., last winter. He is endeavoring to be transferred from the cavalry to some branch of aviation service.

Miss Ruth Law gave an exhibition of looping for the delegates attending the conferences of the Associated Advertising Clubs of the World.

Because she likes the "uncertainty and the sensation of being up in the air," Mrs. Martha E. Farrand, suffragist, of Chicago, is going east to take up aviation. She will study the intricacies of the art under Kenneth Jacquith in Atlantic City. He is a Chicago boy and initiated Mrs. Farrand into the mysteries of air piloting last summer. She wants to fly from Atlantic City to New York before the summer is over.

Despite the fact that Farnum T. Fish, the aviator, has declined the government's offer for scout duty in Mexico, he will give his services provided the situation becomes acute and the need of aviators becomes vital. While his present contracts are attractive, he declares he would discard everything for his country, but believes there is no real need for civilian aviators at the present time.

Chicago Organizing Complete New Squadron
By A. E. Nealy.

Plans are rapidly maturing in Chicago for the organization and equipment of a complete aero squadron. Mr. Vilas, hydro pilot and captain of Company A; Mr. Woodward, of the Illinois Athletic Club, and a number of Chicago's most prominent men, are co-operating for the success of the movement.

Following Mr. A. B. Lambert's visit to Chicago and conference with the Aero Club's officers, the following telegram was sent to the Honorable Newton D. Baker, Secretary of War, Washington, D. C.:

"We offer to the War Department and Signal Corps the free use of our aviation field consisting of six hundred and forty acres, one mile square, of flat land within the city limits of Chicago, situated on Wabash railroad and adjacent to country especially adapted for aviation work and close to water for hydroaeroplane work. We invite you to designate Chicago as a point of mobilization in case a call is made for volunteer aviators. We will provide hangars for all aeroplanes which may be sent here by the Government for training purposes and assure you our hearty support. A complete aviation squadron, provided with practice equipment, is in process of formation here with the object in view of offering its service to the Government."

Word has been received from Congressmen Madden and Mann and the Hon. Josephus Daniels, endorsing the project.

A meeting was held in the Blue Room of the Stratford Hotel to launch the organization and define the contemplated work. Mr. Charles Dickinson, president of the Aero Club of Illinois, opened the meeting. Mr. Vilas and Mr. Woodward explained the object of the gathering. This was followed by a general discussion of ways and means and at a late hour the meeting adjourned to be taken up at another meeting a week later.

At the latter meeting it was announced by Mr. John Wentworth, III, chairman of the executive committee, that $20,000 would be raised to start the company and support training expenses for six months.

Two machines will be purchased, one a land and one a water flyer, with competent mechanics and instructors. At this meeting Mr. Bion J. Arnold, of the Naval Consulting Board, presided. The feature of the evening was the intensely interesting talk given by Mr. John T. McCutcheon of his recent experience as a war correspondent on the aviation fields of Europe.

Over a hundred applications have been received at the offices of the Aero Club of Illinois from mechanics, surgeons, machine gunners, licensed aviators and others who wish to enlist in the various departments of an aviation squadron.

Warn Detroit Airmen

During the past few days flying machines have been operating over Windsor, and the military authorities point out that the aviators, supposed to be amateurs from Detroit, are violating a Canadian order-in-council.

"We have authority to fire on the aviators if we see fit," said Capt. Arthur Paddon, Friday, "and it would be just as well for the aviators to know it. We don't intend to train any guns on the machines, but the aviators should discontinue their visits to Canada in view of the ruling to the effect that they are not desired while the war is on, at least."

Rippon Funds for Aeroplanes

In response to a request from the citizens of Rippon, Wis., Senator Husting, on July 4, introduced a bill in the Senate, withdrawing appropriations of $75,000 for a postoffice building at Rippon and re-appropriating it to the aviation service of the National Guard.

Personal Paragraphs

Leonard Bonney, who is in charge of the General Aeroplane Co.'s school at Detroit, is doing a lively bit of passenger carrying business over Lake St. Clair.

Miss Ybur Osborne, pretty San Francisco girl and native daughter of California, is the first girl in the United States to offer her services as aviatrix to the flying squad of the army.

With Ruth Law, the aviatrix, as the headline attraction on a program of unusual merit, Downs, Kan., will celebrate its thirty-seventh birthday on July 27, 28 and 29.

A. C. Beech is on an exhibition tour in the Middle West.

Emil Laird and Frank Champion are in Montana, covering the country fairs.

AERIAL AGE WEEKLY

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$3,500,000 for Naval Aeronautics

TO concentrate in the development of scouting aeroplanes at sea before undertaking to develop a substantial naval organization, Rear-Admiral Benson, Chief of Operations, was of the belief that only $2,000,000 was necessary for naval aeronautics, and consequently the naval appropriation for aeronautics was not increased to $7,000,000, the sum recommended by the General Board of the Navy.

But the House of Representatives and the Senate both agreed that the sum of $2,000,000, recommended by Rear-Admiral Benson, would be insufficient to even take the first step towards establishing a naval aeronautical organization, such as this country ought to have. Therefore, the appropriation was increased to $3,500,000, and this amount was allowed by Congress last week.

This money will be expended under the direction of the Secretary of the Navy for procuring, producing, constructing, operating, preserving, storing, and handling aircraft, *including dirigibles,* and appurtenances, maintenance of aircraft stations and experimental work in development of aviation for naval purposes. The sum to be paid out of this appropriation under the direction of the Secretary of the Navy for drafting, clerical, inspection, and messenger service for aircraft stations is not to exceed $25,000.

Aero Club of America Commends President's Action in Approving Aerial Reserve Corps

IN authorizing the formation of the Aerial Reserve Corps, which permits, in a very thorough and efficient way, the enlisting of civilian aviators—business men, sportsmen and others who pilot aeroplanes—to become part of the national defenses, under the supervision of the army, President Wilson has established a policy which will enable this country to have a body of trained aviators. In commending the President for his stand on the matter, the Aero Club of America has addressed to him the following letter:

HON. WOODROW WILSON, President of the United States,
White House, Washington, D. C.

My Dear Mr. President:—

The Executive Committee of the Aero Club of America begs to express its appreciation of the personal consideration given to the matter of developing the aeronautical branch of our land defenses by yourself, Senator George E. Chamberlain, and the other members of the Senate Committee on Military Affairs; Congressman James Hay, and the other members of the House Committee on Military Affairs, and Mr. Newton D. Baker, your Secretary of War.

Your action in authorizing the formation of the Aerial Reserve Corps, which permits, in a very thorough and efficient way, the enlisting of civilian aviators—business men, sportsmen, and others who pilot aeroplanes—to become part of the national defenses, under the supervision of the Army, with the opportunity of keeping up their training and gaining efficiency under the direction of the Army, establishes a policy which enables us to have a body of trained aviators, who are made available to meet a national emergency.

The air service of first and second class powers has developed tremendously in the last two years, and to-day there are not less than half a dozen countries having each between 2,000 and 9,000 aviators. If national safety demands that we, too, develop our air service until we have thousands of aviators available to meet an emergency, this policy enables the majority of them to be employed in peaceful pursuits, using aeroplanes as vehicles of transportation, for sport, carrying mail, coast guard service, and other utilitarian purposes.

The Executive Committee has studied very carefully the provisions of the National Defense Act of 1916 for the developing of the aerial defenses in connection with the land forces, and finds that adequate provision was made in the Act for the practical mobilization of the military and volunteer resources available to form an extensive plan of aerial defenses.

Sections 37 and 55 very admirably provide for the directing of the impulses and efforts of patriotic citizens who wish to become part of the Aerial Reserve Corps, making it possible to form a reserve comprising 296 aviators and 2,000 enlisted men; the Federalizing of the Militia makes it possible to develop the twelve aero corps for the twelve Militia Divisions, under the direction of the War Department, maintaining the standard of the Regular Army; section 13 provides for the increase, by authorization from you, of the personnel of the aviation section of the Army, the five increments, providing sufficient personnel to enable the aviation section of the Army to thoroughly supervise the organizing of the Aerial Reserve Corps and the twelve aero squadrons for the twelve Militia Divisions.

The Executive Committee of the Aero Club of America has learned from Senator George E. Chamberlain, Chairman of the Senate Committee on Military Affairs, and Congressman James Hay, Chairman of the House Committee on Military Affairs, that the Committees of both Houses approve the proposed appropriation of $13,281,666 for the developing of aviation in the Army and Militia, establishing the Aerial Reserve Corps, and providing for developments of a technical nature to increase the efficiency and utility of aircraft.

The new Defense Act, therefore, provides most admirably for the immediate mobilization of the military and volunteer resources to form an extensive plan of aerial defenses.

Again expressing our appreciation of the personal interest you have taken in developing our aerial defenses, and assuring you that the Aero Club of America will continue to cooperate in every way possible in the accomplishment of this purpose, I beg to remain,

Very sincerely yours,
(Signed) ALAN R. HAWLEY,
President, Aero Club of America.

Aeronautics in the Coast Guard Service

THE first step toward establishing an aeroplane life saving and derelict hunting service was taken by the Senate when it inserted in the Naval bill just passed a provision authorizing a flying corps for the coast guard. In the hope of favorable action by the House, the coast guard has already begun training some of its officers as aviators. Two have been receiving instructions at the Naval Aero Station, at Pensacola, and one at Newport.

The Senate provision authorizes the establishment of ten coast guard aero stations along the Atlantic and Pacific coasts, the Gulf coast and the Great Lakes. There will be one station at least on Long Island, according to present plans, probably at Fire Island. There will also be a station at Cape Cod and certainly one at Cape Hatteras, the latter being the point at which fully nine-tenths of the derelicts along the Atlantic coast start on their careers.

The coast guard is authorized in the bill to train fifteen commissioned officers and forty enlisted men for the purpose of creating a flying corps. They will receive the same rate of pay now accorded to Naval aviators.

The inclusion of a coast guard aviation service in the Naval bill is based on its value as an asset of national defense in time of war, the coast guard being subject to the orders of the Navy Department under such conditions. But the peace work which is being planned for the flying corps is of much more immediate interest.

Under the present system of searching for and destroying derelicts, which constitute a continual menace to navigation, the coast guard must rely entirely upon the cruising of its cutters, assisted by information received from incoming ships and by wireless. Often, upon the report of a derelict, a cutter will search for a week before locating it, cruising back and forth and slowly extending the radius of the search.

By the employment of aeroplanes for such work acting as scouts for the cutters, it is regarded as certain by marine experts that a vast improvement in the service can be made. The aeroplanes will be used for the location of derelicts, and when a discovery is made the fact will be signaled by wireless to the nearest cutter which will be able to make directly for the spot.

Another feature of the Coast Guard flying corps will be the development of a system of carrying life lines to stranded wrecks. Frequently a wreck is so far off shore that the surf guns now in use are unable to throw a line to it, while at the same time the condition of the sea may be such that it is impossible to launch a boat to the rescue.

The Coast Guard officers have been assured by experienced aviators that it is entirely feasible to send out a line by aeroplane, even against a gale blowing as high as forty miles an hour, or perhaps more. In this way it is believed that the crews of many vessels which are now inaccessible from shore could be reached and their rescue assured.

One aviation concern is making arrangements to demonstrate this system to the Coast Guard and has even gone so far as to offer to show that it can pick up a man from a vessel at sea by the use of an aeroplane and bring him ashore. The Coast Guard aeroplanes will be of the flying boat type, and will have to be fitted with especially constructed pontoons, which will serve to keep the machine afloat in case it falls into a heavy sea.

It may take two years to perfect the service for which the Senate has made the initial provision. In time of war the service would automatically become part of the coast defense. The ultimate plans of the Coast Guard contemplate equipping each of the ten aviation stations with two machines.

The Senate, in making provision for new vessels for the Coast Guard, has also inserted a provision carrying $125,000 for the construction of an ice breaker, to be used in and about New York Harbor, for the maintenance of navigation whenever it is impeded or blocked by ice.

New Anti-Aircraft Guns

(Editorial in New York *Tribune*)

THE official accounts of the anti-aircraft guns mounted in the Pennsylvania and Nevada are, of course, very vague, but it is announced that forty such guns are already built, and this is reassuring if they are half as efficient as they are reported to be. Three years ago we had no guns of this kind; now our ships are to be equipped with what Mr. Daniels describes as "the most effective anti-aircraft guns in the world." And the boast is probably justified if they are capable of doing all that is attributed to them. It is said that they have a vertical range of 27,000 feet.

Comparisons are difficult because we cannot be certain of the ranges of foreign guns. The Germans are supposed to be very well equipped in this way, but according to the experience of French and British airmen hits are rarely scored at more than 14,000 feet or so. Sometimes, however, machines have come under fire at greater heights, and it is recorded that an officer flying at 14,500 feet observed a shell bursting about 1,000 feet above him.

In his testimony before the aircraft inquiry in London the other day General Sir David Henderson remarked that one lieutenant in the British service had in his possession a fuse of a German anti-aircraft shell marked 7,500 metres, that is, about 22,000 feet. He himself did not believe, however, that the Germans would be likely to waste much ammunition on airplanes at an elevation of 20,000 feet. Hence, if our guns are capable of doing mischief at 27,000 feet it may well be that they are superior to those in use abroad.

A Remarkable Achievement

BEHIND the somewhat laconic statement issued by the French Press Bureau on July 24, there is a story of real romance and remarkable achievement. Sub-Lieut. Marchal, of the French Flying Corps, on June 20, at 9:30 o'clock in the evening, ascended at Nancy on board a Nieuport monoplane of a special type, taking with him a supply of fuel sufficient to last fourteen hours. His mission was to cross Germany at a low altitude in order to drop proclamations on the capital, Berlin, and then to descend in Russia.

The official statement continues:

"This audacious flight was accomplished point by point, and after flying all night Lieutenant Marchal was compelled to descend at 8:30 o'clock in the morning of June 21 near Chelm, Russian Poland, at least 100 kilometers (62 miles) from the Russian lines. He was made a prisoner.

"The proclamation which Lieutenant Marchal dropped on Berlin began with the words:

" 'We could bombard the open town of Berlin and thus kill the women and innocent children, but we are content to throw only the following proclamation.'

"Lieutenant Marchal was interned at Salzerbach, whence he forwarded to France a postal giving these details:

" 'I was made prisoner at 8 o'clock on the morning of the 21st at Chelm. The Austrian officers did not believe that I had accomplished my task, but the proof later arrived and they were obliged to bow to the reality.

" 'It was the failure of the spark plugs which stopped me and I descended to change two of the plugs and to start the motor again. Unfortunately it would have been necessary to change two more plugs and at this moment I was taken prisoner. You may judge of my chagrin.'

"Aviator Marchal, in the course of his journey, covered in continuous flight a distance of about 1,300 kilometers (807 miles), most of which he traveled during the night."

Antoine Marchal's flight of more than 800 miles without stop constitutes a world's record. It is also exceptional because every stage of the journey until he was forced to descend by motor trouble was over land. Roland Garros, in September, 1913, made the record for a combined flight over land and sea when he flew from Frejus, near Cannes, in France, to Bizerta, near Tunis, 558 miles, which included the crossing of the Mediterranean Sea. Garros made this distance in 7 hours and 45 minutes. Flying at the same rate he would have been able to cross the Atlantic to Ireland in about twenty-seven hours.

The American record for cross-country flight without stop was made by Victor Carlstrom, who flew with one passenger from Newport News to Sheepshead Bay, 416 miles, on May 21 of this year. His time for the flight was four hours and one minute. Carlstrom on Nov. 27, 1915, had flown from Toronto to New York, about 600 miles, with one stop.

A French sportsman, Brindejonc des Moulinais, flew in 1913 from Paris to Berlin, where he lunched, and to Warsaw, where he arrived in time for dinner. He announced the day before he started that he would breakfast in Paris, lunch in Berlin, and dine in Warsaw, and he acomplished the feat with ease.

There have been various raids in the war in which aeroplanes flew several hundred miles. On April 14-15 three naval aeroplanes flew from the British base in the Dardanelles to Constantinople and dropped bombs on the Turkish capital. They flew more than 300 miles under adverse conditions, being forced to combat wind, rain and thunderstorms.

Shortly after this a French airman beat their record by flying from Salonika to Sofia, where he dropped four bombs on a Zeppelin shed. This was a distance of about 375 miles, and he was forced to fly over the Vitosha Mountain, with its elevation of 7,000 feet and its treacherous air currents.

The Sky Men

Kinsmen to winds are they,
Cousins to clouds that run
With trailing laces of fire
Across the face of the sun;
They mount until the world
Becomes a misty plain,
Each river a silver thread,
And the mighty ocean-bed
Naught but a purple stain—

Till heaven, in sapphire peace,
Beyond all dimming rains,
Opens infinite space
To a new, soaring race,
Whose wings are *aeroplanes*.

Harry Kemp.

The News of the Week

Thomas 135 H.P. Aeromotor Passes U. S. Government Test

The first of a quantity of Thomas 135-h.p. motors for the United States Navy was given a continuous eight-hour full load test before Naval Inspector Charles Cresswell, now stationed at the Thomas Plant at Ithaca.

In speaking of the test, Mr. Cresswell says, "The Thomas motor successfully passed its continuous eight-hour full load run. The motor ran 2,050 revolutions throughout the test and was noticeably free from vibration."

The horsepower developed was 141 at the propeller shaft turning 1,230 r.p.m., which shows that these motors are conservatively rated. The gasoline consumption figured out at 14 gallons per hour, and the oil consumption at 1.6 gallons per hour. The motor was remarkably free from oil leakage during the run, and called forth much favorable comment at the end of the test.

It will be remembered that the Thomas aeromotor was the first aeroplane motor to fit a self-starter as regular equipment. This instrument, a Christensen combination air and gasoline starter, selected by the Thomas engineers only after the most exhaustive trials, demonstrated its value by the ease with which the motor was started on this test.

Throughout the run the two Dixie "80" magnetos performed with marked regularity, all sparkplugs firing without a miss.

L. W. F. Biplane at Michigan Camp

The tractor biplane recently purchased from the L. W. F. Engineering Co., by the Aero Club of Illinois, is in service at Camp Ferris.

H. W. Blakley has piloted the machine. The machine worked perfectly, and at an altitude of about 1,500 feet, Blakley traveled over the entire reservation. Owing to the small, rough landing place, few flights were attempted, Blakley fearing to damage the plane, which will go to the border with the Michigan troops. As soon as the pontoons arrive, so that flights can be made from the lake, teaching will begin. Company A engineers have finished the landing place.

Senate Approves Navy Laboratory

The Senate during the consideration of the Naval bill gave its approval to the committee amendment for the erection of an experimental and research laboratory, and at the instance of Senator Gallinger, provided that it should be erected in Washington on land owned by the government.

The appropriation with which to begin the work was fixed at $1,500,000, with a total limit of cost of $2,000,000.

This laboratory will be for research work on the subject of gun erosion, torpedo motive power, the gyroscope, submarine guns, protection against submarine, torpedo and mine attack, improvement in submarine attachments, improvement and development in submarine engines, storage batteries and propulsion, aeroplanes and aircraft, improvement in radio installations and other necessary work for the benefit of the government service.

Gallaudet Hydro Tested Successfully

The Gallaudet hydro-aeroplane built for the United States Navy by the Gallaudet Engineering Company of Norwich, Conn., made its first flight last week. The flight was very satisfactory and the machine came up to the expectations of the builders. Some time ago the hydro-aeroplane engines were tried out on the Thames, and it was found at that time that there were a few minor details to be looked after before the flight could be made.

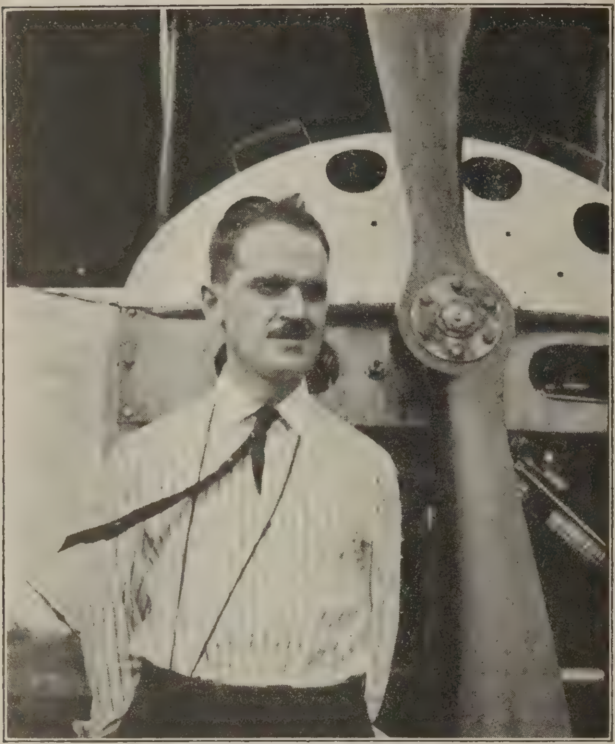
David McCullach, pilot and instructor at the Wanamaker Aerial Patrol School, came to Norwich to take the hydro-aeroplane up on its first flight. His time was limited and he was only able to take the machine up a few times. The machine was taken down the Thames and the flights were made over the river. The two Duesenberg engines worked perfectly from the start and the hydro-aeroplane made fully ninety miles an hour. Pilot McCullach says it is the fastest hydro-aeroplane he has ever driven and he was much pleased with it.

The machine which has been built for the Navy has several original features which makes it of especial value for Navy use. The hydro-aeroplane is equipped with one four-bladed propeller and two 150 horsepower engines. It weighs about three thousand pounds, and is very strongly built.

Export of Aeroplanes

During the week of July 16th, aeroplanes and parts were exported to Great Britain to the value of $148,006.

Mustering into the Federal Service the First Aero Company, N. Y. N. G., at Garden City. The personnel of the Aero Company, which includes many members of prominent New York families, as mustered in, was as follows: Captain Raynal C. Bolling, Lieutenant N. Carolin, J. E. Miller, A. B. Thaw, 2nd Master Signal Electrician; R. J. Gilmore; First-Class Sergeants, P. R. Stockton, F. R. Dick; Quartermaster Sergeant, W. T. Odell; Sergeants, J. H. Stevenson, E. A. Kruss; Corporals, D. G. Frost, D. R. Noyes, E. B. Hagerty, W. P. Willetts, J. R. Speyers, H. H. Salmon, Jr., P. J. Roosevelt, F. J. Hoppin; Privates, E. C. Best, F Boger, Jr., K. J. Bevens, W. W. Conant, Jr., A. M. Craig, J. T. Dwyer, A. L. Favre, C. C. Goodrich, P. J. Henry, W. T. Howell, J. F. Hubbard, W. C. Jenkins, W. J. Johnson, R. J. Knowlson, E. McCormick, E. Martin, D. P. Morse, R. M. Olyphant, Jr., C. H. Reynolds, R. F. Russell, P. D. Smith, J. D. Sullivan, T. F. Ward, and Trumpeter, W. L. Rockwell



Philip Robertson, of Detroit

Anti-Aircraft Guns for the Navy

An anti-aircraft gun, the first to be used by the United States navy, will supplement the armament of the entire battleship fleet and a number of designated cruisers, it was announced in Washington, July 17. The battleships Pennsylvania and Nevada already have been equipped with these guns, and eighteen other ships and cruisers are to be fitted out as rapidly as they are available for Navy Yard work.

The new defense weapon is the result of a three-year experiment by the navy experts of the Bureau of Ordnance. It consists of a machine rifle about fifty calibres long and capable of hurling a three-inch shell 27,000 feet into the air at an angle of ninety degrees and can deliver its charge at rapid-fire rate.

The rifle has been tested and found thoroughly efficient, coming up to every prediction made by the designers. One feature of the piece is that when firing at an elevation it is so disposed that it is impossible for the charge to fall back on the deck.

Two of these guns are to be placed on each vessel. They will be riveted fore and aft on the rear stands of the gun turrets so as to give them the best possible firing radius. In this manner they can be swung into position for firing in all directions. On the boats mounting the old type of turret they will be placed on the boat stands or in the most available location.

Naval experts, under the direction of Rear Admiral Strauss, Chief of the Bureau of Ordnance, have worked three years in turning out the gun. In its development the department has been forced to discard several types. The design of the gun to be used is credited particularly to the officers and experts connected with the bureau, among them being G. R. Marvell, Commander A. L. Norton, retired, and Commander C. B. McVay, assistant to the buerau, who has played a prominent part in its development.

With regard to the availability of the gun Capt. McVay stated today that it was easily constructed, and in an urgent case he had no doubt it would be possible to equip the land forces of the country with a sufficient number of the guns. For the present their use will be confined to the navy.

Rhode Island Naval Militia Aeroplane in Service

Miss Lyra Brown Nickerson, the "little major" of the aviation corps of the Rhode Island Naval Militia and the donor of the Sturtevant seaplane which the aeronautical section is using, took a flight in the machine July 20 from the Quonset camp.

Lieut. Roderick M. Wright, instructor of the aviation section, invited Miss Nickerson to take the flight, which was made along the west shore and then across to Newport.

Burleson Predicts Aerial Mails After the War

Within a year after the conclusion of the war the United States will be criss-crossed with aeroplane mail routes, according to the present expectation of Postmaster General Burleson.

The Postoffice Department recently failed in an attempt to establish thirteen aerial mail routes in New England and Alaska. Instead of obtaining several competing bids on each route, only one bid for one route, an Alaskan one, was received. No contract has been awarded as yet. This failure and the investigation the department has made to learn the cause of it, has led Postmaster General Burleson to the conclusion that the same thing which caused failure in establishing air mail routes this spring will make such routes successful after the war.

"The cause of the failure was the war and the war's end will bring success," Burleson said. 'It was established that the reason bids could not be obtained was because the entire aeroplane supply was being gobbled up by the belligerent nations. But at the end of the war, all the genius in air craft, fostered and developed by the sturggle, will seek a new outlet for its energies."

The Harvard men in training at the Curtiss A. School at Buffalo. Left to Right: E. S. Draper, F. S. Allen, H. H. Metcalf, H. Coolidge, F. I. Amory, W. B. Bacon, R. H. Stiles, J. R. Torrey, D. D. Harries, E. E. Bates, P. Bryan

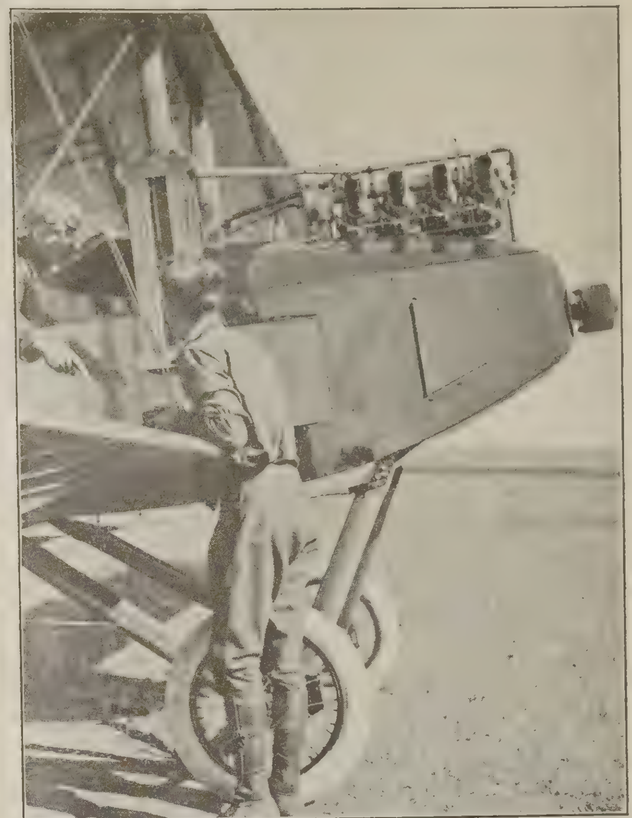
Hall-Scott News

The Hall-Scott Company reports a most flourishing business. The plant has been enlarged to double its size during the past two months, and even now cannot take care of the business at hand. Over four hundred "Big Sixes" will be manufactured and tested out within the next three hundred days. This rapid increase of business, however, does not mean that inferior workmanship or less rigid inspection will be allowed to enter into the construction of these big motors. The inspecting force has been increased proportionately, and from results upon the block, and actual flights, our product proves it is constantly being improved.

The latest test upon the block was a twenty-four hour run with a type A-5 equipment, selected at random by the inspector. This was started at 6 A. M., and not stopped until 9 P. M. The motor was stopped at this time as a law exists in Berkeley not allowing motors to run after 9 P. M. The motor was covered up and sealed by the inspector and started by him the following morning at 6 A. M., running continuously until 4 P. M., making the twenty-four hours. During the complete test the average horsepower was 130, running at a speed between 1,250 and 1,300 r.p.m.

The recent tests of our four-cylinder, Type A-7 equipment in the latest improved Glenn L. Martin "T8" Army tractor was of great interest. This simple equipment, developing 90 H.P., throttled down perfectly and accelerated to 1,400 r.p.m. with an exceedingly small amount of vibration.

Capt. Vogelsang rode with Floyd Smith during the tests and stated it was the finest equipment of equal power he had ever flown with. Immediately after the successful tests and acceptance of the plane, an additional order was placed with the Glenn L. Martin Company for two more similar tractors.



The four-cylinder, 90 h.p., Hall-Scott engine installed in a special Glenn L. Martin military tractor

Personal Pars

O. W. Timm, the aviator who came to Grinnell to take the place of the late Billy Robinson, but broke his own machine soon after his arrival, has nearly completed a new biplane of extra strength and equipped with a 100 horsepower engine of the Grinnell type. He will try out this new machine the coming week, and expects to be able to perform any of the aerial stunts demanded at public exhibitions of the flying art. He will leave here about the first of August and has enough dates already booked for exhibition flights to occupy his time for the rest of the summer.

Eddie Rickenbacher, dare-devil automobile pilot, thinks the air is safer than the track and is planning to desert the auto game to become an aviator.

Eben S. Draper, son of the late ex-Gov. Draper, and brother of Mrs. Thomas Gannett, Jr., of the Manchester colony, has given an order for an aeroplane. It is to be ready next month. Mr. Draper is at Buffalo with the Harvard aero squad. On its completion Mr. Draper will join Norman and GGodGfrey L. Cabot, George R. Fearing, Gordon Balch, Bayard Tuckerman and Clifford L. Webster, 10th deck division of the Massachusetts naval militia aeronautic section. The H. Bristow Drapers of Hopedale, will go to Magnolia next month.

Aviator A. W. Davis will establish his hangar permanently at Squalicum Beach (Washington) and during the summer will make exhibition flights over the city, carrying passengers. Mr. Davis says that his Curtiss flying boat is one of the best best on the coast and built especially for passenger work. This will be the first time that any professional aviator has made his headquarters in the city.

William Brock, formerly with the Thomas Bros. Aeroplane Co., is to open a school shortly at Springfield, Ohio.

Press despatches state the O. E. Williams Aeroplane Co. will move their school to Waco, Texas, this fall.

Remarkable picture of the Amityville, Long Island district, taken from Mr. Lawrence Sperry's flying boat by Mr. Perley H. Noyes

The Model H. S. Wright Pusher Biplane

Allies Buy Washington Spruce

The Entente allies have in the last year paid $1,500,000 for Oregon and Washington spruce to be used in the manufacture of war aeroplanes, according to Associated Secretary Robert B. Allen, of the West Coast Lumbermen's Association. Twenty million feet of spruce have been shipped overland to New York, Boston and New Orleans, and by steamship direct from Puget Sound. It was necessary to log six to ten times as much spruce as the total shipped. The pieces used were 60 to 75 feet long, without a blemish.

Hinckle Gets into French Squad

Edward Foote Hinckle, formerly of Cincinnati and Minneapolis, has been accepted by the French authorities as a pilot in the American Aeroplane Escadrille. This makes the total of Americans engaged in the French service seventy. Mr. Hinckle, whose son, William Henry, was graduated from Yale in 1909, gives his age as forty. He is the oldest man in the American Escadrille. The French age limit for military aviators is twenty-nine, while ordinarily the limit for the American Escadrille is thirty-five.

Ensign Astor Flies with Naval Militia

Vincent Astor, who two months ago joined the Naval Militia, has risen from the ranks of a private to an Ensign and in this capacity is in charge of the aviation section of the Second Battalion encamped at Bayshore, L. I. His lately built Burgess-Dunne hydroaeroplane is being used every day by Ensign Astor's organization.

The encampment consists of the First and Second battalions, the First in charge of Lieut. Harris, and numbering in all about thirty men. A large tent has been provided for each organization, which is used as a hangar. Weather conditions permitting, the men start flying at 4 o'clock in the morning and continue all day, taking time out only for their meals.

Ensign Astor's battalion has made sixty-five flights since the encampment opened, in many of which he took part. Records are being kept of each flight and altitude, weather conditions and other details are noted. The highest altitude reached so far was made by Lieut. Harris, who went 800 feet aloft in the First Battalion's Curtiss flying boat.

The First Battalion has been encamped on Great South Bay for nearly a month as the result of the offer of Charles Lawrence to give the Naval Militia use of his grounds. Most of the flying was done at first on Saturday and Sundays, when the men could spare time from their business. At present, however, they are in camp on the same basis as the various training camps.

Navy Hydroaeroplane Tested in France

A United States navy hydroaeroplane ordered in France before the war was recently tested by Lieutenant Bernard Smith of the United States Marine Corps on the Seine near Juvisy. The craft is now being rebuilt preparatory to shipment to the Norfolk, Va., Navy Yard within two weeks. It is of the tractor type, with an exceptionally wide main single float. It is propelled by a single screw from a 240-horsepower Salmson radial motor. With a speed of ninety-five miles an hour it is said to be the fastest hydroaeroplane in the world. It is certainly the highest powered and fastest in the possession of the United States navy.

Senator Ashhurst Speaks

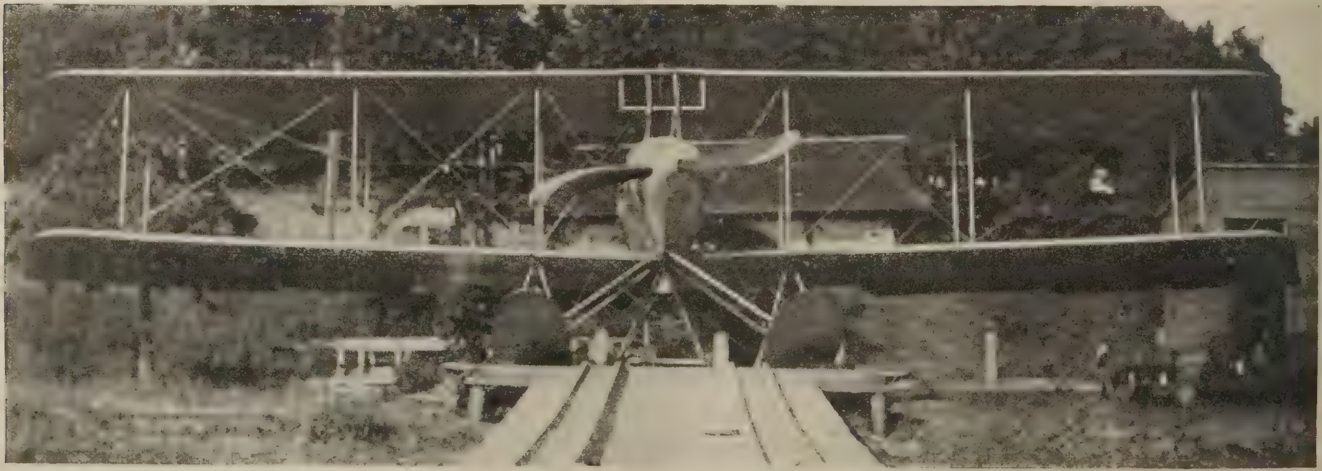
In a special message to the readers of the San Francisco *Examiner,* Senator Henry F. Ashhurst, of Arizona, had this to say concerning aerial preparedness:

"The fact cannot be disputed that if the army under General Pershing had been equipped as it should have been with aeroplanes, that officer would have been able to locate the Mexicans and the ambush of American troops would have been avoided.

"It is incomprehensible why our army has been denied the service of these 'eyes,' without which no European army would think of going into a strange country and without which, under modern conditions, no battle can be undertaken.

"If we are to have a war with Mexico it is a sad commentary upon our condition of preparedness that war may be charged to the absence of a part of an equipment that was invented in this country, but which, like many other things, has never been properly developed.

"I am glad to see that a number of new aeroplanes have been ordered by the War Department, but it is too late now to make good the damage that has been accomplished because we did not have them in the service in Mexico at the time when they were most needed."



The Strutevant hydroaeroplane, which is owned by the Naval Militia of Rhode Island

STANDARDIZATION IN AERONAUTICS

It developed recently that the entire visible supply in this country of certain kinds of suitably seasoned woods for aeroplanes has been contracted for by foreign governments since 1914. This is one of the many indications of the necessity for action on the part of engineers and manufacturers engaged in the design and production of aircraft. The National Advisory Committee for Aeronautics recently held a meeting with a view to bringing about co-operation between the United States Government and designers and manufacturers of engines in the development of motive power for aircraft, and members of this Board attended a meeting of the Aeronautic Engine Division of the Standards Committee of the Society of Automobile Engineers held at the Bureau of Standards in Washington this week. The purpose of the S. A. E. Committee Meeting is practically identically the same as that of the standardizing activity which the society has maintained for many years in the motor car field. All the work under way is for the purpose of laying properly and efficiently now in time of peace the whole foundation upon which the art of aeronautics will be based. The development in this country should proceed more efficiently than has been the case in Europe under stress of unprecedented warfare. It must be appreciated, of course, that this development will take time. Considerable mechanical difficulty is being experienced with aeroplanes throughout the world. Real hope of progress lies in the United States Government purchasing and using the machines now on the market and working in close co-operation with the manufacturers and engineers and Standards Committees, for improvement in every phase of the aeronautic art.

At the semi-annual meeting of the Society of Automobile Engineers held in June during a cruise on the Great Lakes, definite proposals were made for changing the name of the organization to "Society of Automotive Engineers," and to give aeronautic, motor boat and other branches of engineering presentation on the Council of the Society. This will allow engineers specializing in these various branches to take part in the work of the Society. The S. A. E. has revolutionized the American motor car industry by adopting various standards which have in turn been followed by the manufacturers. It is hoped that the same work will be done for the aeronautical, motor boat and allied industries depending upon the internal combzustion engine for motive power.

As has been pointed out by President Russell Huff, of the S. A. E., it is not necessary to review in detail the many points of mutual interest and the close relationship of the engineers in the automobile, aeronautic, marine, tractor and stationary gas engine fields, except, suffice it to say, that such important problems as the fuel question, specification of material, methods of test, engine lubrication, ignition, thermal efficiency, mechanical efficiency, balance, cooling, cost, weight and many other such phases of engineering study are common to these lines of development.

Henry Souther stated at the meeting held recently in Washington that the great value of co-operation between engineers being now appreciated, the S. A. E. Committee in conjunction with other committees will advance the art of aeronautics rapidly, the National Advisory Committee for Aeronautics having in the Society of Automobile Engineers one engineering body to which to refer matters.

The problems connected with the development of the types of apparatus under consideration are of a highly technical nature, while the multiplicity of accessories attached to their operation requires every sort of engineering activity. The rapid advance in the design and construction of air, land and water transportation mediums, as exemplified by the aeroplane, automobile and motor boat, has naturally resulted in the formation of plans permitting complete co-operation in all engineering matters in the Government and commercial activities.

Dr. S. W. Stratton has announced that the Bureau of Standards will establish an investigational department through which the scientific knowledge being acquired in the many laboratories devoted to aeronautics can be disseminated. At the S. A. E. meeting just held Howard E. Coffin, of the Naval Consulting Board, pointed out the necessity of informing builders as to the relative demand for aeronautic engines of different size and capacity. This suggestion proved to be one of the most illuminating made at the Washington meeting, inasmuch as it involved discussion as to the amount of engine power which can be used efficiently in different types of machines for varying uses, from craft for schooling purposes to those of the battle type, as well as desirable propeller speeds and other pertinent questions. It is clear that a special set of spark-plug specifications must be developed for aeronautic work, extending the scope of the present S. A. E. standard specifications and perhaps changing some of them. The desirability of standardizing the fundamental dimensions involved in the mounting of propellers on driving shafts has been appreciated for some years but no actual effective recommendation has as yet been made. The S. A. E. Committee is now canvassing the engine, propeller and plane manufacturers and users with a view to the adoption in this country of the propeller hub established as standard in France. It is obvious that interchangeability on planes of propellers of varying size and make is practically essential to adequate commercial development of the aeroplane. Certain pipe fittings which have proved satisfactory in installation on automobiles are in some respects inadequate for aeronautic use. This subject will be considered thoroughly by the Carbureter Fittings Division of the S. A. E.

The National Advisory Committee for Aeronautics will issue shortly a nomenclature, one of the items of which has caused vexation in settlement, namely, the definition of right and left hand engine as applied to their disposition in tractor as compared with pusher machines. It was decided at the committee meeting just held to recommend the method of nomenclature already established in electrical engineering, that is, to use the terms "clockwise" and "anticlockwise," the observer standing facing the end of the power delivery shaft.

The current work of the Electrical Equipment Division of the S. A. E. in recommending sizes of flexible tubing up to 1 inch inside diameter will be helpful in aeronautic standardization.

While there is some difference of opinion on the subject, it is thought that engine interchangeability in planes will be of considerable importance soon because definite data must be furnished engine builders desiring to take up manufacture of aeronautic engines.

There is a tremendous amount of simplifying work to be done in the aviation field, just as was the case in the motor car field. While regulations have been drawn from time to time by various authorities as to what engine accessories should be included in computing gross weight per horsepower, it is still felt that the weight of each item such as engine, ignition apparatus, carbureter, radiator, etc., should be given separately, with a view to deciding later just what items should be included in the calculation.

A number of exhibits of aeroplane parts and accessories were collected for consideration at the Washington meeting, such as wood specimens broken in the laboratory, piping, manifolds, cylinders, valves, propellers, radiators and engines, most of the samples having been sent recently from the Mexican border.

Among those attending the meeting were: Henry Souther, Chairman; H. M. Crane, F. S. Duesenberg, A. F. Milbraith, Glenn L. Martin, A. Ludlow Clayden, Chairman, S. A. E. Standards Committee; Coker F Clarkson, General Manager, S. A. E.; Director S. W. Stratton, Chairman Motive Power Subcommittee of National Advisory Committee for Aeronautics; Dr. H. C. Dickinson, R. P. Devries, B. L. Wormley, W. S. Lewis, T. J. Mosley, E. L. Lasier, Howard E Coffin, Chairman Industrial Preparedness Committee of Naval Consulting Board; Elmer A. Sperry, Naval Consulting Board; M. B. Sellers, Naval Consulting Board; Captain V. E. Clark, United States Signal Office; Naval Constructor H. C. Richardson, Secretary National Advisory Committee for Aeronautics; Naval Constructor J. C. Hunsaker, Lieutenant W. G. Child, G. D. Wardrop, Editor, Aerial Age, Spencer Heath, R. R. Grant, W. D. Yenawine, Alan R. Hawley, President Aero Club of America, and Henry Woodhouse, Governor of the Aero Club of America.

THOMAS BATTLEPLANE

OWING to the demand for a double engine machine having capabilities of both speed and weight carrying, The Thomas Brothers Aeroplane Company, of Ithaca, N. Y., have under construction such a machine as shown by the illustrations. Every effort has been made to standardize the various clips, fuselage struts, wing spars, etc., for rapid and economical production. It will be noted that the undercarriage is made up of steel tubing and sheet steel, with a minimum number of welds. The engine bed is of particularly rigid construction, well braced from the longerons. With but slight modifications, pontoons may be substituted for the landing gear shown, to adapt it for water use.

The machine is controlled from the nacelle which is located between the two fuselages. When it is to be used as a battle plane, the pilot sits in the middle and at each end is located a machine gun operator. The front end of this nacelle extends well beyond the line of the two tractor propellers, so that the operator in front has a clear range for gun fire of 180 degrees. The same is also true of the operator in the rear. The nacelle is particularly rigid and of unusually light construction. The sides and bottom are of heavy 3-ply substantially braced as shown.

Machines of this type can be turned out at the rate of two a month for the first month, and after six weeks can be delivered at the rate of two each week.

General Dimensions

Span, top	78′ 5″
Span, bottom	61′ 11″
Chord	7′ 0″
Gap	6′ 6″
Length over all	37′ 6″
Height over all	9′ 9″
Weight	5,250 lbs.
Area, lifting surface	952 sq. ft.
Load per sq. ft.	5.5 lbs.
Useful load	2,400 lbs.
Speed range	48-89 M.P.H.
Required horsepower	270

Planes

Main planes are in twelve sections. Wing curve, "Thomas Brothers" special. Spruce ribs, 7 ft. long, 3/16″ web, I section. Planes braced internally with double 12-gauge piano wire. Covering best Irish linen, doped and varnished in the usual manner.

Maximum camber of top wing sections, 6¼ in.; maximum camber of bottom, 1¾ in. Planes set at an incidence angle of 2½ degrees. Planes have no dihedral. Aspect ratio of planes, 1 to 10.

Streamline spruce struts, 6′ 6″ in length. Fineness ratio of struts, 1-2.5. In all there are 36 struts. Wiring is with Roebling 19-strand cable, doubled. Samples of wire tested by Professor Upton, Sibley Mechanical Laboratory, Cornell University.

Over each fuselage the rear edge of wings are pivoted and can be folded back along the fuselages, making the machine quite compact for its size. In this position, the main plane sections extend a few inches beyond the tail flaps.

The weight of the main plane group, without ailerons, is 500 lbs.

Fuselages

Sides are flat, top and bottom rounded off at the radiator and running back straight as far as trailing edge of planes, where it then tapers in a straight line to the tail. Sides have a uniform width of 2′ 9″ throughout their length, tapering to a chisel edge. Each fuselage is 31 ft. long, and at the forward end is 3′ 6″ high, 2′ 5″ wide.

Two fuselages (wired) including nacelle but not the control surfaces and power plant ,weigh 500 lbs.

Vertical fins are attached to rear of fuselages. From them the rudders extend 4′ 1″ beyond the tail plane. Tail plane 20 ft. long 2′ 7″ in width. Overall length of tail flap, 22 ft.; width, 3′ 9″. Fins and tail plane are braced from the fuselages by steel tubes.

Chassis, V type, eight steel struts with streamlining, having a fineness ratio of 1-2.5. At each fuselage an 8-gauge steel tube axle is used, spacing wheels 3′ 4″ apart. Overall tread of wheels between both fuselages, 14′ 6″. Stranded rubber shock absorbers bind the axles to chassis. Ash tail skids also sprung on shock absorbers. The landing gear complete weighs 140 lbs.

Nacelle

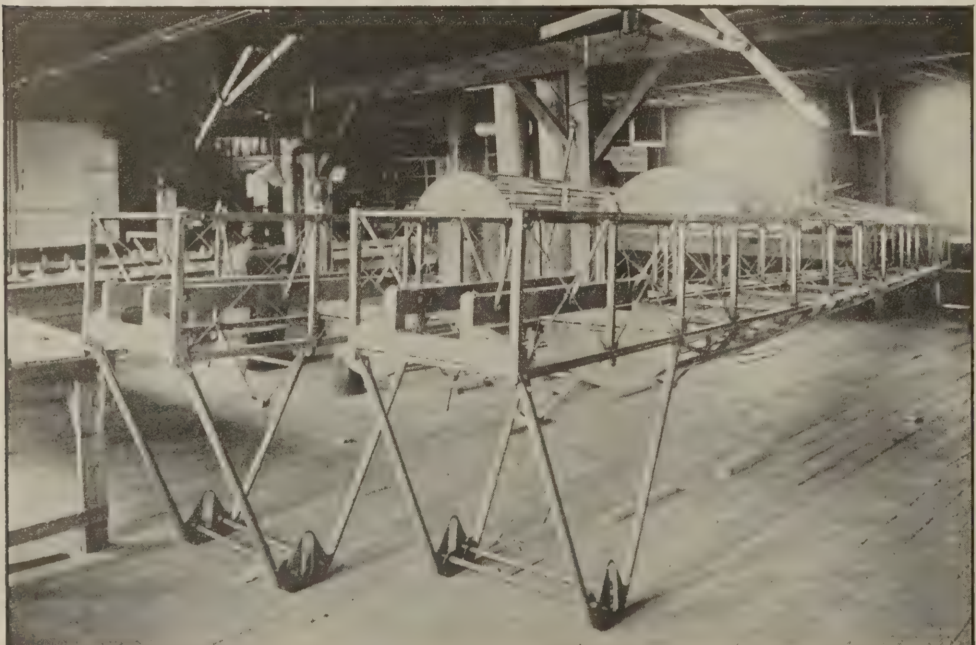
A pilot and two gunners are accommodated in the nacelle, located at the center of machine. Gunners are seated at either end of nacelle, and the pilot between them. The construction is rigidly braced with veneer and cross members, as shown in the accompanying photograph. Nacelle is 2′ 6″ in width and depth. It is supported and suspended midway between planes by steel tube members.

Control, Deperdussin; foot bar to rudders. Rudders connected to one another with cable, and control wires from them run through the fuselage to the foot bar, as indicated by the dotted line on the drawing. Hand wheel operates wing flaps or ailerons on the upper plane. Wing flaps 16′ 5″ long, 2′ 3″ wide. Rocking post operates elevator or tail flap. This control cable runs directly from nacelle to the flap. Control action by chain and torque tube.

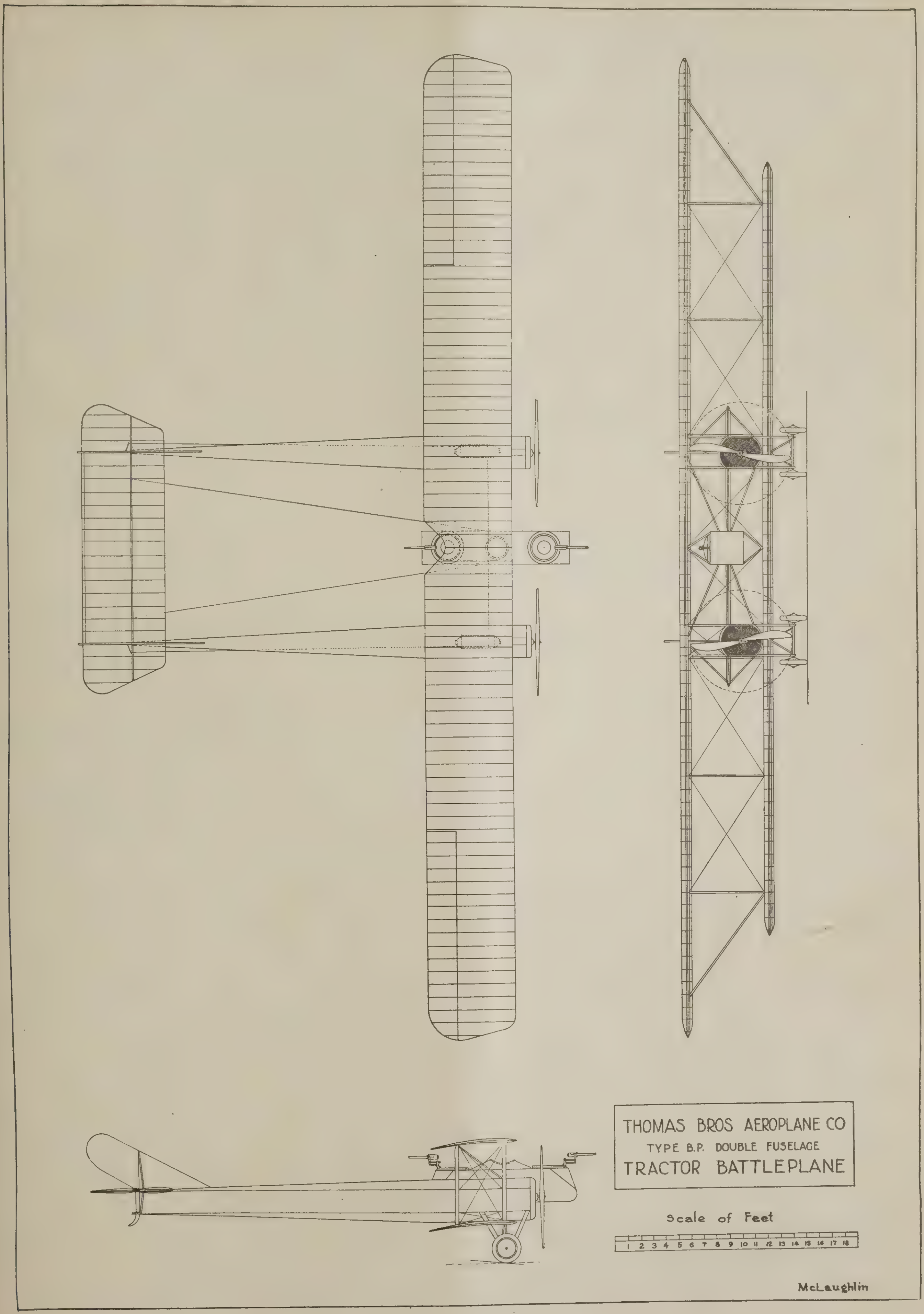
Provison is made for carrying ammunition, bombs, rations, tool kit, fire extinguisher and first aid kit.

Instruments on pilot's dashboard include a barograph reading up to 7,000 feet, revolution counter, Pitot tube, inclino-

(*Continued on page* 610)



Fuselage construction of the Thomas Battleplane


THOMAS BROS AEROPLANE CO
TYPE B.P. DOUBLE FUSELAGE
TRACTOR BATTLEPLANE
Scale of Feet
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
McLaughlin

DYNAMICAL STABILITY OF AEROPLANES

By Jerome C. Hunsaker, Eng. D.

Assistant Naval Constructor, U. S. Navy, Instructor in Aeronautical Engineering, Massachusetts Institute of Technology
Assisted by T. H. Huff, S. B. D., D. W. Douglas, S. B., H. K. Chow, S. M., and V. E. Clark, Captain U. S. Army

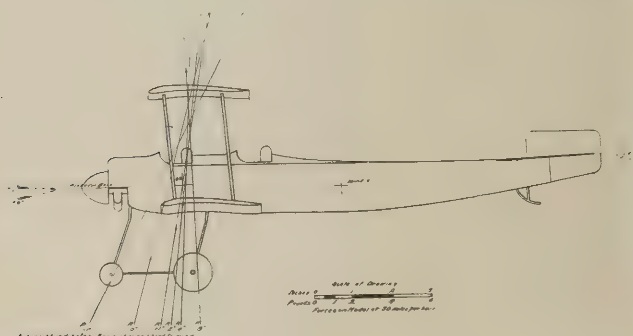


FIG. 1C. Resultant force vectors; tail — 5°

The lift and drift coefficients Ky and Kx were computed from the observed L and D, using such units that the coefficient is pounds force per square foot area per mile hour velocity. Curves of coefficients are given on figure 2, which also shows the ratio L/D, a measure of the effectiveness of the

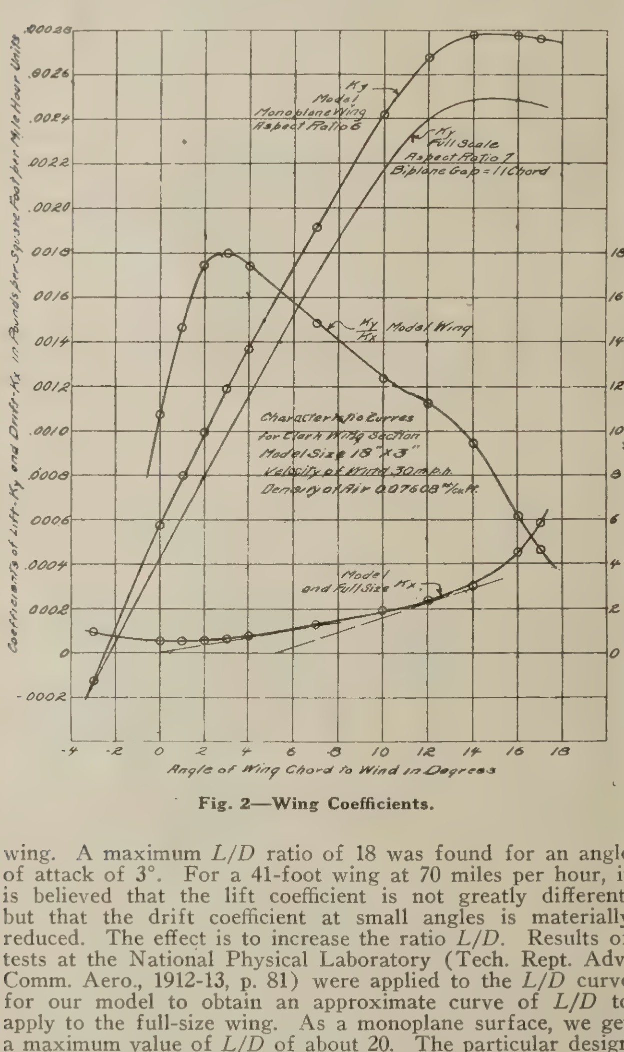


Fig. 2—Wing Coefficients.

wing. A maximum L/D ratio of 18 was found for an angle of attack of 3°. For a 41-foot wing at 70 miles per hour, it is believed that the lift coefficient is not greatly different, but that the drift coefficient at small angles is materially reduced. The effect is to increase the ratio L/D. Results of tests at the National Physical Laboratory (Tech. Rept. Adv. Comm. Aero., 1912-13, p. 81) were applied to the L/D curve for our model to obtain an approximate curve of L/D to apply to the full-size wing. As a monoplane surface, we get a maximum value of L/D of about 20. The particular design is a biplane of aspect ratio 7. Well-known corrections for biplane interference loss and aspect ratio gain were applied to get a corrected curve for use in the design.

The center of pressure for this wing is shown by figure 3, as well as the contour of the section. Center of pressure is defined as the intersection of the resultant force on the wing (represented as a vector) with the plane of the chord. It is seen that the wing section is unstable longitudinally at small angles. That is, if the wing heads down so that the angle of attack becomes — 3°, the moment of the resultant force tends to turn it down still farther.

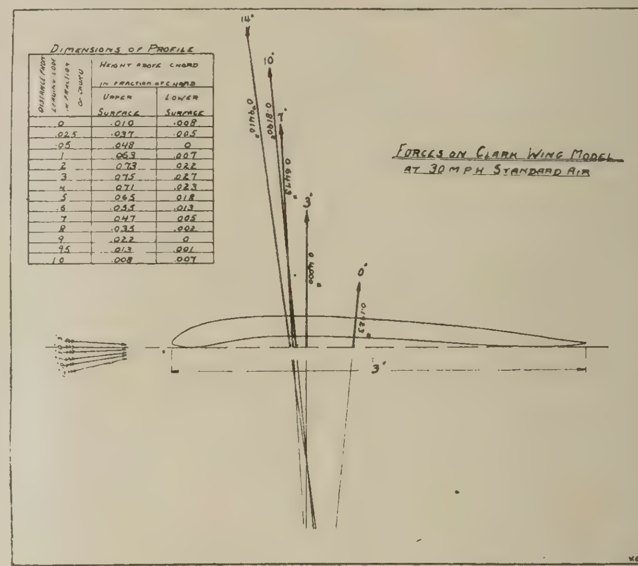


Fig. 3—Wing section dimensions and resultant force vectors.

Applied to the aeroplane, it is necessary to balance and correct this tendency to dive by horizontal tail surfaces of proper size and attitude.

§5. LONGITUDINAL BALANCE

The complete model, using wings of the section described above and fitted with the tail shown in figure 1, was mounted in the wind tunnel on the balance with the wings vertical. A vertical spindle from the balance was driven into the side of the body at the point shown on figure 1. By swinging the model about the vertical axis passing through the spindle, the angle of the wind to the wing chord was varied from +20° to —8°. At each attitude the force across the wind or lift L, force down wind or drift D, and the pitching moment about the spindle were measured. The wind velocity was 30 miles per hour for all tests. The signs were taken so that an actual lift, actual drift, and a stalling moment are positive. Density of air is at 15° C., 776 mm. Hg., dry.

Test No. 1 was made with the horizontal tail surface making an angle of —2.75° with the wing chord. That is to say, the rear edge of the tail was tilted up. Test No. II was a repetition but with the tail at —7°. Test No. III had the tail surface at —5°.

The lift and drift in pounds on the model at 30 miles per hour are given below, and on figure 4.

	Case I		Case II		Case III	
i	L	D	L	D	L	D
— 4	— .049	+.1147	— .172	+.1363	— .115	+.128
— 2	+ .18	+.1011	+ .035	+.1103	+ .112	+.108
— 1	+ .32	.0988	+ .143	.1047	+ .240	+.104
0	+ .454	.099	+ .298	.1014	.360	.101
+ 1	.569	.1016	.437	.1011	.490	.102
+ 2	.703	.106	.572	.1028	.625	.105
4	.927	.121	.807	.1135	.872	.115
6	1.131	.143	....	.....	....	....
8	1.32	.167	1.224	.1381	1.305	.153
10	1.484	.195	....	.....	....	....
12	1.604	.236	1.537	.2213	1.568	.213
14	1.653	.313	....	.....	....	....
16	....	....	1.640	.391	1.64	.370
18	1.606	.547	1.614	.509	1.58	.498

The lift and drift at first sight appear to differ for the

three cases, but it will be observed that the maximum lift is 1.65, 1.64 and 1.64, and the minimum drift is .099, .101 and .101 for the three cases respectively. The discrepancy is 1 per cent only and is about the precision of the measurements. The

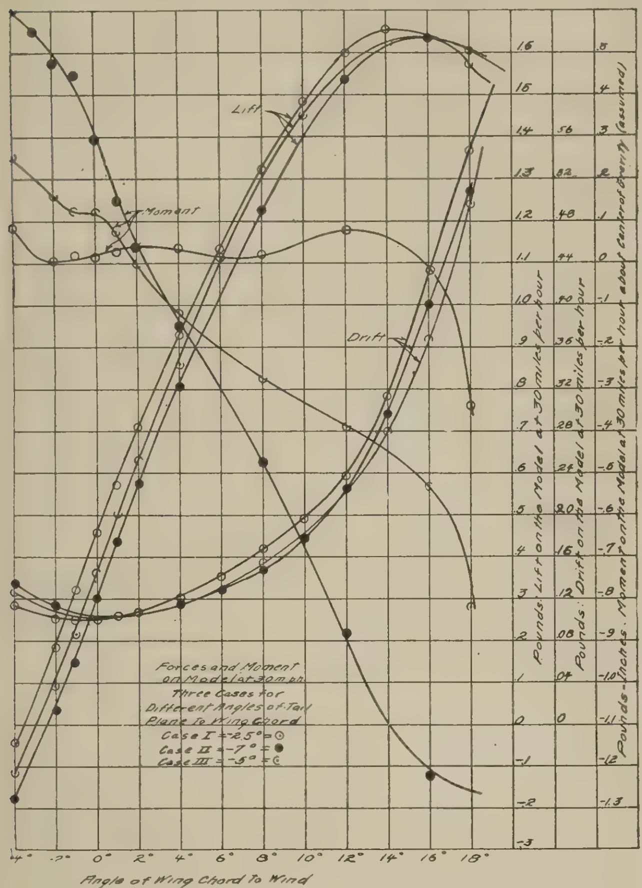


FIG. 4.—Curves L, D, and M for three tail settings.

comparison is best brought out by eliminating reference to angle of attack as the effect of the change in tail angle appears to be mainly to move the curves of L and D, plotted on i, to the right or left.

Figure 5 shows the ratio L/D for the model for cases I, II, and III, plotted on L in pounds as abscissæ. For small values of L and angles of incidence between —2° and +2°, corresponding in practice to high-flight velocity, the curves

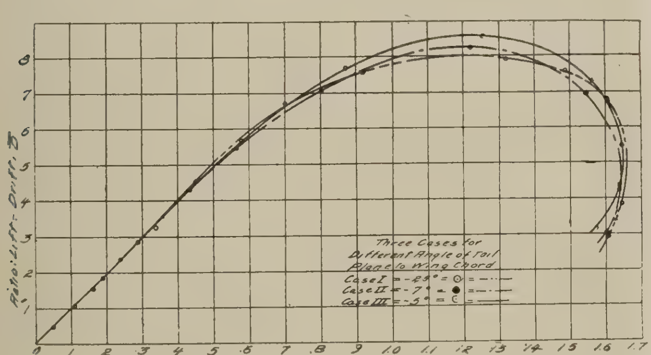


FIG. 5.—Curves of L/D plotted on L for three tail settings.

are practically identical. For angles of incidence near 8°, the L/D ratio for case III is 8.6, while it is 8.2 for case II, and 8.0 for case I.

It appears, therefore, that changing the angle of tail surface has but slight effect on the lift and drift of the aeroplane. The actual aeroplane should have the same maximum and minimum speeds in any case since the maximum lift and minimum drift are about the same regardless of angle of tail surfaces.

The statical stability against longitudinal pitching is, however, very different for the three cases. Thus the pitching moments (observed about the spindle and converted to the pitching moments about the assumed center of gravity) are as follows, in pounds-inches on the model at 30 miles per hour. Positive angles and positive moments are stalling angles and stalling moments respectively.

PITCHING MOMENTS, POUNDS-INCHES

i	Case I	Case II	Case III
— 4	+.089	+ .599	+.26
— 2	+.008	+ .473	+.16
— 1	+.022	+ .454	+.12
0	+.016	+ .292	+.12
+ 1	+.030	+ .143	+.07
+ 2	+.037	+ .037	—.01
+ 4	+.039	— .159	—.12
6	+.016	....	...
8	+.023	— .476	—.28
10	....	....	...
12	+.086	— .884	—.39
14	....	....	...
16	—.013	—1.328	—.53
18	—.336	—1.378	—.82

Case I, with tail at —2.75°, shows very small pitching moments and may be said to be neutral for ordinary angles of incidence. Thus if the aeroplane be flown at +2° incidence, in order to maintain balance at this attitude the pilot must impress a diving moment of —.037 pound-inch (on the model) to overcome the stalling moment + .037 given above. Then if the aeroplane be accidentally tilted up to +12° by a wind gust or other cause, in the new attitude the net pitching moment is still positive, and hence tends to tilt the machine still more. It is, therefore, unstable unless the pilot intervenes with the horizontal rudder.

For case II, tail at —7°, there is a strong righting moment always acting to prevent stalling or diving. The machine is very stable, in fact excessively so. For instance, flying at 2° incidence, the moment to be held by the pilot is very small. Suppose, however, he wishes to fly at +12° corresponding in the full-scale aeroplane to about 36 miles per hour. To maintain a balance at +12° incidence, he must exert a stalling moment by use of the horizontal rudder equal to about

$$\frac{.884}{12} \times (26)^3 \left(\frac{36}{30}\right)^2 = 1{,}970 \text{ pounds-feet.}$$

The arm of the elevator is about 20 feet (distance aft of center of gravity), requiring a lift of 100 pounds on the elevator flaps. The elevator is able to exert this force if turned up about 10°. The elevator motion available for control in gusty air is thus largely used up in maintaining balance. The drift on this elevator flap may be over 20 pounds, making a waste of 3.5 propeller horse-power, or about 6 brake horse-power.

It is preferable to balance a machine at high speed by placing the center of gravity well forward. Then the pilot will have to carry his elevator turned up when flying at low speed. But at low speed, he is most in need of the full elevator motion for control of pitching. We, therefore, conclude that case II, with fixed stabilizer at —7°, is very much too stable or stiff longitudinally, and case I, with stabilizer at 2.75°, is not stable enough.

Case III, with stabilizer at —5°, appears to balance longitudinally at +2° incidence, and at +12° incidence to have (full size) a natural diving moment which could be held by a negative lift on the elevator of only about 44 pounds, corresponding to about 4° elevator angle. Consequently, it was decided to adopt the arrangement of case III for the subsequent stability investigation.

(To be continued)

Better Wireless for Air Fighting

Marconi, the inventor of the wireless telegraph, has recently returned to London with news of a great improvement of the wireless apparatus capable of being carried by an aeroplane.

"The new developments," he says, "will not only make wireless communication in this war more efficient than ever before, but will make it more difficult for the enemy to intercept and tap messages.

"These improvements will apply to instruments in aeroplanes and airships. Hitherto aeroplanes have been at a disadvantage with airships in wireless work, for although they were able to transmit messages, they have not been able to receive them. This was because the receiving signal was too faint to be distinguished, being drowned by the noise of the aeroplane engine. Now we have been able to strengthen the receiving signal sufficiently to enable messages to be taken."

AERO ENGINES ANALYZED

By CHARLES E. LUCKE

Part 2 (a.)—AERO ENGINE PROCESSES AND FUNCTIONS OF PARTS VERSUS POWER-WEIGHT RATIO, RELIABILITY, AND ADAPTABILITY FACTORS.

In any machine the process is of superior importance to the mechanism as the latter is but one of many possible means for the execution of the former, and however necessary it may be to have the mechanism adapted in form, proportion, arrangement, and materials, to its objective process, success of the machine is fundamentally dependent on the process itself. Most machine processes are really combinations of a series of separate individual process steps working together, just as the mechanism parts themselves coact, and these processes are commonly said to be similar when they consist of the same partial steps executed in the same order as a series, and machines executing them are regarded as belonging to the same class, or as similar machines. There are, however, very great differences to be found in these similar machines which, therefore, may be vastly dissimilar from other standpoints. In the first place the process steps may differ widely in degree though being identical in kind, and this difference in degree may be in turn responsible for very considerable differences in mechanism. No better illustration is available than the common piston steam engine in which one basic step is expansion of steam after admission and before exhaust, yet experience has developed a whole succession of valves and valve gears, some adapted to moderate and others to high expansion ratios, while expansion to pressures below atmosphere immediately calls for the condenser with its elaborate series of auxiliary appliances and pumps. Differences in mechanism may be almost infinite even though the same process is executed, and to the same degree, and the steam engine will again serve as an illustration. Such differences may be significant or not. They must be regarded as significant when some good purpose is served, whether the differences are those of detail parts form such as the shape of a piston; of arrangement of the same typical parts, such as the locomotive engine as compared with that of the steamship; of proportion of parts, as diameter of cylinder or thickness of wall; or of material. Such differences as are now accepted and well understood in the steam-engine field can all be analyzed into significant or indifferent from the standpoint of service requirements. These service requirements require years of experience to be appreciated to a degree that permits of a reduction to standards of practice in arrangement, form, proportions, and materials of the mechanism and its parts. Even after the establishment of such experience standards of practice for machines performing a definite fixed service there will always remain very considerable differences of the indifferent or non-essential order.

Aero engines, while belonging to the now large and established class of internal-combustion engines, and to the smaller fairly well-developed subclass of the gasoline carburetor internal-combustion engine, in which the farm, automobile, and boat types are most fully developed, are themselves still struggling through the development stage, due to the youth of the special service to be performed, and in spite of all that might be borrowed from the older most similar arts. In fact there is some evidence that these older arts have exerted a distinct retarding influence even where assistance might be expected, because borrowing is the easiest mode of acquisition. It is not unnatural to find automobile practice being adopted for aero engines, when it is not yet clear that there is anything required of the aero engine sufficiently different from what the automobile or boat engine can supply, to make the latter unsuitable for the service of the former. At the same time there is equally strong evidence that in some respect the differences in service requirements have been exaggerated or misinterpreted with the result that totally different engines were produced unlike anything before built, and yet just as unsuitable as the borrowed auto or boat engine.

In proportion as service requirements on the one hand become better understood, and as engine capabilities or limitations, on the other hand, are recognized and utilized, so will the aero engine as a type come into full growth. Review of the engines so far proposed, built, and tried out, indicates a strong trend in some directions, but just as surely proves that in most essentials the period of blind grasping at every possibility whether rationally defensible or not, has not yet come to an end. The most hopeful sign of progress is the now general recognition that no older type of engine can be borrowed bodily for aero service, and following this, the larger number of suggestions for modification that have been and are now being made, some rational, derived through reasoning from fact data, but often without any recommendation other than mere purposeless difference.

Most of the rational development so far accomplished has been devoted to forms of the type parts, to their grouping or general arrangement, and to special materials for their construction, rather than to the processes that are fundamental to the gasoline carburetor type of internal combustion engine. Aero-engine designers being so intensely absorbed in the problems of arrangement of parts, adaptation of form of parts, reduction of metal thickness and application of materials of high elastic limit or low specific gravity, have in some instances, though fortunately not all, been diverted from thought of the process steps to be executed, in kind and degree. This becomes clear by comparisons, first of aero engines with each other and second of any one engine with the absolute standards of thermodynamics. It is clear that if at the same speed and using the same fuel one engine gives a materially higher mean effective pressure than another, or a lower specific fuel consumption, then some elements of the thermodynamic process have been violated by the mechanism of the inferior machine. It is also true that if the thermal efficiency obtained is a smaller fraction of the thermodynamic limit of possibility than in an auto engine, for example, then again something has been incorporated in the aero-engine structure inferior to its counterpart of the auto engine structure. To a lesser degree similarly, if aero-engine stoppages not due to seizure of bearings or breakage of parts are more frequent than in auto engines, or even if they stop at all under these conditions, then the process requirements are in some way being violated by unsuitable mechanism, for if they were not the engine would continue to run, and without change. As a matter of fact, the whole question of reliability is one of maintenance or continuity of the process in every stage, assuming, of course, an absence of the pure mechanism troubles of breakages or bearing failures. Likewise, some of the elements of the adaptability factor, as well as those of reliability or of high power and fuel efficiency, are concerned with the process, for, should excessive tilting of the engine interfere with the carburetor action and result in poor mixtures, or should passage through a cloud or fog obstruct the intake with frost or ice, or should flights at excessive altitudes change the mixture, then the engine becomes inoperative by reason of process interference due to lack of adaptability of the mechanism to the maintenance of the process when subjected to the ordinary interference of actual use peculiar to air flight.

Proper execution of the processes by mechanism that insures its continuity in kind, and the constancy of every step, in degree, regardless of any interfering conditions incident to normal or even extraordinary aerial use, is a necessary prerequisite to the high mean effective pressure and high thermal efficiency that together make for low power plant weight per horsepower for any length of flight. It is just as essential to the continuity of operation and output that constitutes reliability, entirely independent of whatever contribution may be obtained to the same end, from variation of general arrangement, and detail design of parts as to form or thickness or from the selection of special materials.

The processes are comparatively simple and easy to state, though a thorough analysis of the relative or absolute perfection of execution that various designers have accomplished through their mechanism would require far more space than is available here. Such an analysis must moreover be based on far more test data than have even been made available anywhere. Judging from the literature of the subject and from some familiarity with general practices not so recorded, it can be stated that practically no work has been done except by a few large engine building concerns who keep their results secret, and comparatively speaking, no data obtained bearing directly on the execution of the process steps, and the effect of design on process, for aero engines, though some interpretation can be based on the few overall results of engine tests. While the details of design versus process are beyond the scope of this report, it is possible even from a statement of the processes and their fulfillment conditions, to derive some general specifications for the parts of the apparatus that, taken together, make up the power generating part of the engine, as distinguished from those parts that merely transmit or support.

As the working medium is primarily an explosive mixture of air and the vapor of gasoline, the first broad process step is mixture making, preparatory to introduction into the cylinder unless it be made directly therein. This must be followed by the second step of suitable treatment of the mixture in the cylinder, including expulsion of burnt products. Finally, as combustion develops heat in contact with metal walls, continuity of operation or the maintenance of a steady state in all respects requires heat abstraction and dissipation to a degree and at a rate equal to that of heat reception, so the third broad process step is cooling.

Each of these three broad divisions of the general power generating process, mixture-making, cylinder treatment of mixture, and combustion chamber cooling is itself a process, and is in turn sub-divisible into more detailed or sub-processes, each definable to some extent as to degree or range that it is desirable to maintain.

The mixture-making process starts at the point of supply of gasoline and air and ends at the intake port of each cylinder. The one exception to this used in a few engines is the making of mixture directly in the cylinder by pump injection of gasoline, a method so wholly unsuited to the small cylinder high-speed engine, with such volatile fuel as gasoline, as to be rejected without further discussion not only on rational grounds but on actual comparative experience with the now standard system of mixture making. This standard practice that has taken many years to establish recognizes mixture-making as a distinct function to be carried out external to the cylinders, so as to permit of some control of this independent function without the interference that must result when it is combined with others in a single apparatus part.

Applying the common but more or less inaccurate name of carburetion, to this mixture-making function because the principal structural element of the process is the carburetor mechanism, the process divides itself into (*a*) fuel supply; (*b*) air supply; (*c*) carburetion proper, which includes proportioning, mixing, and vaporizing, and (*d*) mixture distribution to cylinders. Each of these steps must be carried out without variation in spite of anything that might happen beyond extraordinary accidents, and the apparatus, mechanism, or equipment must be so constructed as to insure the results desired. This is by no means easy, as will appear from even a superficial analysis of conditions and possibilities. Air must be taken from the atmosphere through which the machine is moving at a high, though not constant speed, a speed so high that the air pressure equivalent to the velocity, or velocity head of the air, is quite appreciable. With the air intake opening pointing in the direction of travel the velocity head is added to the static pressure of the air and air flow necessarily varies with flight speed, though it should not. This might be avoided by suitably shaped entrance orifice, the plane of which is in the direction of flight, but this is no safeguard when turning or in side gusts. The first requirement of air intake must, therefore, be independence of flow of air with reference to direction and speed of motion. Atmospheric air varies in absolute pressure with altitude and likewise varies in temperature, in water vaporized, and suspended water such as fog or rain. Each of these things exerts separately and together an influence on carburetion. Temperature, pressure, and moisture affect air density and hence the flow through the air orifice under a given pressure drop. Temperature affects the vapor pressure of the gasoline. (Absolute pressure affects air flow itself independent of the density change.) Vaporized moisture affects the accumulation of water in the mixture passages due to reduction of temperature incident to gasoline vaporization, and both vaporized and suspended moisture affect the accumulation of ice in the mixture passages, unless heat be added in sufficient degree. These things need hardly be stated to be accepted as fundamentally important and as necessary elements for incorporation directly or indirectly into specifications for the air supply to the carburetor. The carburetor action should be made quite independent of these variables and it must be sufficiently independent to prevent changes of mixture quality beyond the allowable working range. Therefore, however great a variation may be encountered during actual flight, in direction and velocity of flight or wind, in barometric pressure, in atmospheric temperature, in atmospheric moisture vaporized or suspended as well, the mixture quality must be kept within the two limits to be determined as necessary to continued engine performance.

Gasoline must be carried in a closed tank and must be fed to the carburetor through a pipe, and the supply to the carburetor should be quite independent of the direction and angle of inclination of the whole structure. It positively must be unaffected by such changes of relative position of tank and carburetor, as may be due to not only ordinary but even extraordinary or emergency turning, gliding, climbing, or temporary falling movements of the whole machine. If the machine should completely fall and upset, the gasoline should be prevented

from running out on the hot exhaust pipe as this is likely to cause a fire. Gravity feed from tank to carburetor is affected, as to head, by every variation in angle and direction of inclination of the frame. Gravity feed tanks must have an air vent and so if overturned the vent becomes a spill hole unless a special check feature be added. In stationary plants gravity feed form supply tanks is forbidden by the fire underwriters' regulations because of the possibility of drainage of the whole tank due to a leak in any part of the pipe system. Air or gas derivable from fire-charged bottles, from pumps, from combustion chamber relief valves, or from exhaust back pressure acting on the liquid surface in depressed gasoline tanks will feed the gasoline from any relative position of tank and carburetor. If reasonably high pressures are used in comparison with the normal static gasoline head, the delivery pressure will be substantially constant at all inclination angles and spilling will be confined to the small carburetor float chamber as the main tank is closed. This system is in quite general use in auto practice. Pump feed from a main depressed tank with air vent to a small auxiliary gravity tank with overflow return directly above the carburetor, is the standard stationary system. Recently automobile practice has adapted this to its service requirements, replacing the pump and overflow return by a vacuum lift system operated from the suction header beyond the throttle, but retaining the depressed main tank with air vent and the small auxiliary gravity tank without air vent, which being so close to the carburetor can supply it at all times at substantially constant head. These two systems of pump and suction header lift may be operated with a closed main tank if slightly modified and in the event of a leaky pipe no loss or fire can occur because instead of gasoline escaping air flows in, doing no harm if the leak is small, but stopping the supply without loss if the leak is large.

The extraordinary changes of motion in direction and speed, both horizontally and vertically, peculiar to the aeroplane introduce liquid inertia and centrifugal pressures which may accelerate or retard gasoline flow by raising or lowering the pressure at the point of delivery to the carburetor. This is a peculiarity of the aero-engine service conditions which requires special attention. To cover all these influences an additional specification may be added for the carburetion system; the fuel tank, piping, and supply system must deliver fuel to the carburetor at pressures that do not vary enough to cause the mixture quality to vary beyond the limits required for the proper steady operation of the engine regardless of angularity of the machine or of changes of its motion as to direction or velocity, and they must be such as to prevent fuel loss from small leaks and to minimize any spilling when overturned, preventing whatever spills touching hot parts or reaching electric sparks. References to the literature are made for actual tank arrangements which require no comment here except the approval of the practice of using more than one tank and especially of installing a small emergency reserve tank holding enough to insure a safe landing after main tanks are empty.

When supplied with atmospheric air and with fuel under pressure or static head, the carburetor mechanism is supposed to make a proper explosive mixture and through intake header and branches to deliver to each of the several inlet valves identical charges of that mixture equal in quality and quantity. This is supposed to happen regardless of the total quantity of mixture required by the engine load or speed and regardless of any variation in air temperature, pressure, moisture, direction, and velocity of flight or fuel delivery pressure. The possibilities of success in attaining this mixture-making ideal must, of course, depend on the definition of proper mixture, for in this is to be found the allowable range of variation from absolute constancy of quality.

Mixtures that enter the cylinder with too much gasoline for the air to support in combustion will not be explosive if the vaporized fuel excess is large enough and with such mixtures the engine is inoperative. Long before such a great fuel excess as this is reached the engine may be operative yet operate badly. It is clear that any excess vaporized gasoline in the mixture can not burn, so it will decompose or carbonize, depositing carbon all over the combustion chamber, including spark plugs and piston head, and show in exhaust as smoke. Such a mixture will be operative for a time, such time as it takes for the carbon to accumulate in layers thick enough to glow on hot spots, such as piston heads, causing back fires or preignition and possibly short circuits and miss fires from collections on spark plugs if they are so designed as not to be self-cleaning. Carbon deposits will also cause piston rings to stick and leak and impair lubrication when it collects on cylinder walls and between rings. To be sure, a certain amount of just such carbonization can be traced to lubricating oil that works past pistons, but this is an independent matter to be separately treated by oil selection and supply system. Excess fuel in the liquid state may be present when the vaporized part and the air make a proper mixture, and such excess will partly decompose as above, but part will be dissolved by the lubricating oil and defeat lubrication besides being a dead loss.

Excess vaporized gasoline in the mixture should be prevented, first, to prevent carbonization, but also to avoid the slow combustion that results when the excess is too great. A small excess gives the highest rate of combustion and high rates of combustion are necessary in aero engines to permit of attaining the highest initial cylinder pressures with the very high mean piston speeds in use, none of which are below 1,000 and some in excess of 2,000 feet per minute. By use of properly high compression and more than a single point of ignition a sufficiently high rate of combustion appears to be obtainable without resorting to such overrich mixtures with their carbonizing evils and direct waste of fuel. It may therefore be set down as a requirement that mixtures preferably should not contain any excess fuel at any speed and load, and positively must not contain enough to cause carbon accumulation, measurable fuel waste, or interfere with lubrication.

It goes almost without saying that mixtures of air and fuel must be homogeneous and uniform throughout; that is, the constituents must really be mixed. On reaching the cylinder at least, no liquid should remain unvaporized, or, to use a short word, the mixture should be dry. A correct overall ratio of gasoline to air by weight as required for combustion reaction will not serve the purpose if the gasoline is in liquid form, or even if it is vaporized, but all concentrated in one corner of the combustion chamber with pure air in some other corner, such as is sure to happen with direct injection or with more unvaporized liquid admitted past the inlet valve than can be vaporized while entering. Such nonhomogeneous and wet mixtures will both carbonize and cut lubrication even if total weights are correctly related, so the second and third requirements of mixture must be homogeneity, and dryness at least after admission.

Other things being equal, a cool mixture carries more heat per cubic foot and hence more work capacity than a hot mixture of the same fuel and air. But with liquid fuel, mixtures that are too cold are no mixtures at all, any more than a brook running through the country can be said to be mixed with the atmosphere, though rain by a stretch of the imagination might be, and a fog really is, though not so intimate a mixture as vaporized moisture. Any gasoline-air, kerosene-air, benzol-air, or alcohol-air mixture, in combining proportions may be dried if the temperature be high enough and the temperature required will be least for the fuels of greatest vapor pressure of their heaviest constituent if they are solutions of heavy and light parts, as is the case with the petroleum distillates. For any one fuel the required drying temperature is least the more intimately the air and fuel are mingled or stirred, so that any fuel particle will be required to exert only the partial pressure of the vapor in the final mixture, instead of the full mixture pressure of one atmosphere that is necessary without true mixing. Mixtures should, therefore, be as cool as possible consistent with dryness and the maximum permissible moisture is that which will vaporize on entrance. The higher the mixture pressure the greater the work capacity of the charge, so that everything that contributes to such must be promoted as much as the preparation of cool and otherwise proper mixtures. This means in effect that the pressure drop between the air and the cylinder must be a minimum, but this is entirely a question of proportions of passages.

Finally with reference to mixture quality there can not be much excess air, preferably none. Of course, excess air can not cause carbonization or lubrication trouble; in fact, it exerts a beneficial influence tending to burn accumulated hot carbon or lubricating oil vapor, and it permits of a somewhat higher compression which improves economy. But all the explosive mixtures of hydrocarbon vapors and air become non-explosive in ratios very close to the combining proportions on the excess-air side, and with even a slight air excess the rate of combustion becomes prohibitively low. Summarizing mixture-quality requirements, a mixture is proper when it has the least and preferably no excess of either air or fuel, when it is homogeneous, when it is dry after entrance and as cool as possibly consistent with homogeneity and dryness, and when it is supplied at the maximum absolute pressure. To produce such mixtures is the function of the carburetor.

Carburetor mechanisms capable of making mixtures of such specified quality under the previously noted conditions of air and fuel supply are practically nonexistent at present, and improvement can hardly be expected so long as carburetor production remains a separate business, and purchasers buy on name instead of on performance, as is the practice, selling on name only, at present in the motor-car and motor-boat industries. Not until the aero-engine producer develops carburetor specifications in terms of mixtures produced and testing appliances to prove fulfillment and to locate causes of nonfulfillment of each separate requirement can the needed mixture-making carburetor be obtained. Under these conditions it matters very little whether the aero-engine builder makes his own or buys on guaranty of performance, independent of engine operation.

Very great progress has been made in recent years in carburetor design for automobile and marine engines, but the end has not been reached, because all data point to a failure to maintain the quality of mixture in all the specified respects. In some respects the problem is less difficult with the aero engine than with the auto, as the former is not subjected to as wide a range of flow rates nor to such sudden and frequent changes in flow rates as are the latter, due to automobile driving in dense traffic or over country roads with constant changes of grade, curves, and rough spots requiring continuous opening and closing of the throttle. This fact is responsible for the general practice among aero engine builders of buying stock automobile carburetors on the theory that, the service being less severe, they should work better on aero service; yet such a conclusion is not warranted. While it is true that flow rate fluctuations will not be so great and so cause less variation in proportions, it is also true that the normal condition of flying with feed throttle wide open or nearly so produces a more intensive temperature drop, reducing vapor pressure and decreasing the degree of gasoline vaporization or increasing mixture wetness and condensing or freezing more water. It is also true that far stronger variations of fuel and air supply conditions must be encountered in air flight than in road driving. What is still more significant, however, is the fact that the aviator has no such opportunity to make hand adjustments as has the chauffeur, nor are the consequences of auto-engine stoppage due to bad mixture hardly more than annoyance, while such a stoppage of an aero engine may mean a complete wreck. It can not be too strongly stated that acceptance for use of standard carburetors on their names, or even reputation, is not a satisfactory practice for aero engines. They should be designed or purchased to specifications of maintenance of mixture quality under all variations of working conditions within possible ranges to be met with in service.

There seems to be no doubt after the years of experience in carburetor construction for automobiles and boats that the gasoline float chamber apparatus, with simultaneous vacuum flow of gasoline and of atmospheric air, is permanently established and must be retained. Adhering to this principle of construction as the basis of proportioning and of the first step in mixing, does not prevent the addition of other elements to correct the faults inherent in the simple combination. Mixture proportioning correctors in the form of compensators to reduce the natural tendency for gasoline to flow in excess at high rates of vacuum when the ratio is correct for low. are now available in considerable variety and some are fairly good, though even in the best there is considerable room for improvement. These compensators constitute the principal differences between modern carburetors.

It is in control of mixture quality in other respects than proportioning that carburetors now available are lacking; for example, to render the mixture quality independent of atmospheric changes, fuel supply, pressure fluctuations, and above all independent of their own cooling action. This self-cooling is due to vaporization of gasoline, the latent heat for which lowers the temperature of the mixture below that of the entering air. Heat must be supplied if liquids are to be vaporized, and no amount of human ingenuity can overcome this law of physics. If the latent heat of vaporization be supplied from waste heat sources for so much of the gasoline as can vaporize in its air supplied at atmospheric temperature, then the resulting mixture will have the same temperature as the atmosphere and there will be neither vapor condensation nor water freezing on the intakes. Such mixtures especially when the air is cool are not sufficiently dry and certainly are variably dry, dryness varying with atmospheric temperature. To produce even this much effect requires a considerable amount of heat from either hot jacket water or exhaust gases. To get this amount of heat into the entering air or the mixture it is necessary to observe the laws of heat transmission and provide sufficient heating surface of suitable form. To simply surround the body of the carburetor with a water jacket or to take the air from a short exhaust-pipe jacket, which are the only means now in general use, is entirely inadequate, as can be proved by simply taking the mixture temperature by a thermometer in the intake pipe or by observing the flow through experimental glass headers and branches. Of course such wall heaters will prevent any adhering frost, but they can not prevent its formation as free snow to be drawn into the cylinders. This problem of mixture making by carburetors is one of the most

(Continued on page 610)

ENGINE HOUSINGS ON EUROPEAN AEROPLANES

We are indebted to our contemporary, *Flight*, for information on the various engine housings used on British and French machines.

While a great deal of time and attention has been given to the stream-lining and other refinements on the fuselage of the tractor aeroplane it seems that the constructors in Europe are showing little ingenuity in the problem of mounting and housing the engine on the pusher. Of course, the tractor has been found to be more efficient in many ways in the present war and it is probable that for this reason but little attention has been turned to the pusher. So we are led to either of two conclusions: that the stream-lining of the pusher is of little importance, or that it presents more difficulties than the stream-lining of the tractor.

Let us examine the first case and determine if there is any reason for supposing that a good stream line casing around the engine of a pusher biplane is of less importance than in the case of an engine mounted in the nose of a tractor. From experiments in wind resistance it has been found that truncating the tail does not have a very serious effect on the resistance until it reaches a certain point, after which further truncation increases the diameter of the "dead" region and the resistance goes up at a rapid rate. From this it is easily apparent that a rotary engine placed on the extreme end of a nacelle would present a considerable dead resistance to the wind, and therefore it can not be said that the stream-lining of the engine is of less importance in the pusher than in the tractor.

We also know that while the nose of a fuselage can be kept rather blunt without much loss in efficiency, the tail of a streamline must be considerably pointed to give the best results. It can be easily seen that when the engine is placed directly in the rear, the cowl enclosing it must be very wide, necessitating a wide nacelle, to which it would be very difficult to impart a good stream-line shape.

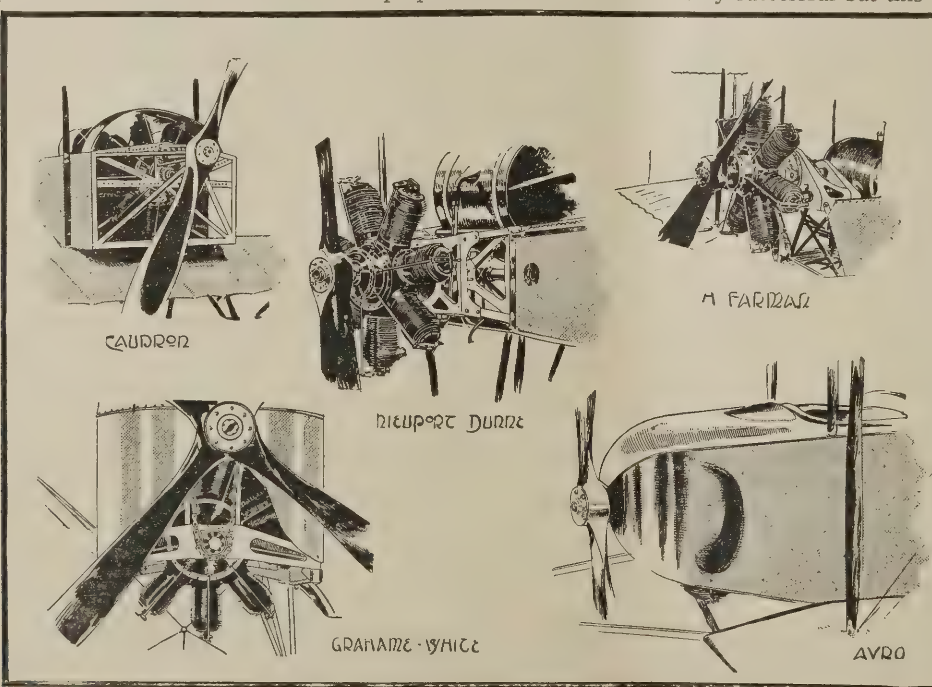
The other alternative would be to arrange the mounting so that only the ends of the rotating engine would project beyond the casing or nacelle. While the normal resistance in this case would be very great, it must be remembered that the cooling of the engine is of greater importance than the saving of a pound or two in resistance. Judging from the performances of the Pemberton Billing machine and the De Haviland scout, two very speedy British aeroplanes, which have the ends of the rotating cylinders projecting beyond the body of the nacelle, it would seem that this manner of housing the engine will have but little effect on the speed of the machine. On the other hand, in both these machines it would appear probable that an even better speed could be obtained by adding to the crank-case a conical aluminum tail-piece mounted on and revolving with the engine, and serving to decrease the diameter of the dead region caused by the comparatively flat surfaces of the crank-case, propeller boss and the inner ends of the propeller blades.

Let us examine the illustrations of the mountings in use before the war, and deal first with that of Henri Farman, since his machine was the prototype of the pushers. Owing to the comparatively shallow depth of the Farman nacelle and to the placing of the latter down on top of the lower wing, it has been necessary, in order to bring the center of thrust into coincidence with the center of resistance, to raise the engine slightly above the upper main beams of the nacelle. This is accomplished in the Farman by mounting the engine on two pressed-steel bearers of the shape shown in the illustration, one of which is placed fairly close against the front cover of the crankcase, while the second is situated further forward and supports the front end of the crankshaft. The engine, it will be seen, is hung cantilever fashion, a method which is thought by some constructors to be quite unsatisfactory, but which is employed without any apparent disadvantages. Another form of mounting is shown in the illustration of the Nieuport-Dunne biplane. Here the engine is overhung as in the case of the Farman but instead of the pressed steel bearers resting on the upper rails only, they are attached to both upper and lower rails of the nacele.

In the Caudron Pusher Seaplane the rotary engine was mounted between two bearers, the shape of which can be seen in the illustration, and the drive was through gear reduction.

We then come to the only two examples of engines enclosed in aluminum cowling. They are the Avro and the Grahame-White, exhibited at the last Olympia show which took place in London. In the Avro, the engine was mounted between double bearers, the front one of which was the ordinary pressed steel type, while the rear one consisted of a ball-race supported on four tubular extensions of the main beams (top) of the nacelle. Air was admitted through a scoop on top of the nacelle and escaped through the lower portion of the housing.

In the Grahame-White pusher the engine was mounted on three bearers, one of which was adjustable in a verticle sense, while the second was self-aligning. The drive was through chain and sprockets, and the propeller was mounted on a shaft carried in bearings shown in the illustration. The lower part of the cowl was left open, and air was admitted to the housing from underneath instead of above, as was the case with the Avro biplane. From an external of the whole nacelle, one received the impression that it was of streamline shape, but flying "wrong end forward." This was not the case in reality, however, for the flow of the air over the bottom of the nacelle and into the cowl was following a different path from that indicated by the outline of the nacelle. It would appear probable that the rear verticle portion of the nacelle would afford great resistance and neither this type of the Grahame-White nor the Avro proved very successful but this might have been due to other causes.

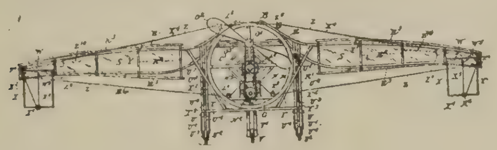


Engine housings on European aeroplanes

RECENT AERO PATENTS

BY WILLIAM N. MOORE

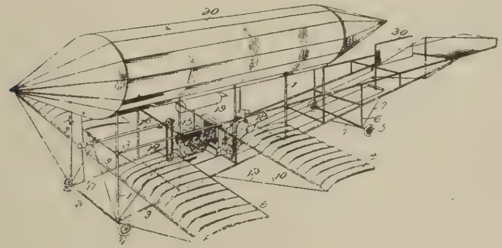
1,178,174. AIRSHIP. Morris Newgold, New York, N. Y. Filed Dec. 29, 1911. Serial No. 668,446. (Cl. 244—29.)



1. An air ship comprising a main frame, aeroplanes capable of tilting transversely relatively thereto, means for augmenting the effective surface area of the downwardly tilting aeroplane to cause said planes to be returned to normal position, and weights connected with said surface augmenting means and concurrently movable therewith toward and away from the center of the ship whereby the action of said augmenting means in returning the aeroplanes to normal position is assisted.

2. An air ship comprising a main frame, aeroplanes capable of tilting transversely relatively thereto, means for automatically augmenting the effective surface area of the downwardly tilting aeroplane to cause said planes to be returned to normal position, and weights connected with said surface augmenting means and concurrently movable therewith toward and away from the center of the ship whereby the action of said augmenting means in returning the aeroplane to normal position is assisted and manually operated means for concurrently actuating said augmenting means and said weights independently of said aeroplanes.

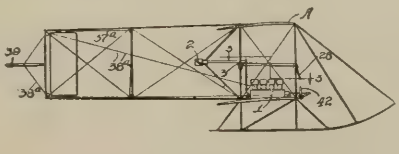
1,177,973. FLYING-MACHINE. Frank E. Summers, Memphis, Mo. Filed May 22, 1915. Serial No. 29,822. (Cl. 244—6.)



A flying machine comprising a rigid frame having sides of greater height at its front end than at its rear end, rigid beams projecting laterally from the sides of the frame below the top thereof at and near the front end of the same, planes secured to said beams and extending rearwardly therefrom, a motor secured upon the frame near the front end thereof, a propeller at the front end of the frame operatively connected with the motor, a buoyant tank supported directly by and above the frame and extending longitudinally thereof and having tapered ends, a horizontally disposed rudder at the rear extremity of the frame, a vertically disposed rudder near and in advance of the horizontal rudder, means for controlling said rudders from a point near the motor, ground wheels at the lower front corners of the frame, hangers depending from the rear portion of the frame and ground wheels on said hangers, the ground wheels supporting the frame when it rests with the rear end off the ground but tilted downwardly.

1,182,025. STABILIZER. Alfred J. Macy, Chicago, Ill. Filed Jan. 27, 1913. Serial No. 744,555. (Cl. 244—29.)

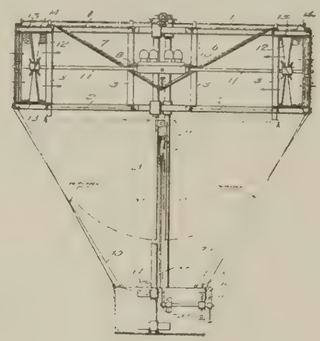
1. A stabilizing mechanism comprising equilibrium governing means, engine exhaust pressure operated power cylinders adapted to actuate the same, and means acting automatically to bring said cylinders into operation.



2. In a device of the class described, electrically controlled valves, and engine exhaust pressure cylinders operated thereby adapted to actuate controlling mechanism of a vehicle.

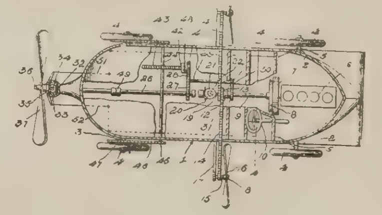
3. In a device of the class described, an engine, balancing mechanism, fluid controlling electrically operated valves, and power mechanism actuated from the exhaust of the engine through said valves, adapted to operate the balancing mechanism of the device.

1,183,683. AIRSHIP. Charles Henry Hamilton Scott, Lynchburg, Va., by Charles B. Scott, committee, Lynchburg, Va. Filed Apr. 16, 1915. Serial No. 21,938. (Cl. 244—18.)



1. An airship of the heavier than air type comprising a main frame, a main sustaining plane carried by said frame and consisting of a pair of planes arranged in angular relation so as to form a V, a series of blowers on one side of said sustaining plane, a second series on the opposite side, means for operating each of said series so as to force air inwardly and from opposite directions toward said main sustaining plane, certain opposed fans or blowers on opposite sides of the main sustaining plane being arranged to revolve in one direction, and other opposed fans or blowers being arranged to revolve in the opposite direction.

1,183,484. AIRSHIP. Edward Hunter Page, Covington, Va. Filed Feb. 19, 1915. Serial No. 9,427. (Cl. 244—15.)



An air ship of the character described comprising a body, a motor within the body, a drive shaft extending longitudinally of the body, a clutch connecting the drive shaft with the motor, a spur gear mounted on the drive shaft near the clutch, a counter-shaft extending parallel with the drive shaft, a spur gear on the counter-shaft and meshing with the first named spur gear, a spur gear mounted on the opposite end of the countershaft, a rear propeller shaft mounted in parallel relation with the counter-shaft and in direct alinement with the drive shaft, a propeller on said shaft, a spur gear carried by the forward end of the propeller shaft meshing with the last named gear on the counter-shaft, a clutch intermediate the ends of the propeller shaft and arranged to control the operation of the propeller, means to permit the propeller to swing in order to steer the device, a stub shaft interposed between the drive shaft and the rear shaft and in parallel relation with the counter-shaft, a clutch connecting the drive shaft with the stub shaft, a vertical shaft mounted directly above the stub shaft, helicopters mounted on the vertical shaft, means to drive the vertical shaft from the stub shaft, sprockets mounted on the stub shaft, brackets extending laterally from the body, stub shafts mounted in the brackets, propellers carried by the stub shafts, and sprockets on said stub shafts, chains connecting the last named sprockets with the first named sprockets, a second counter-shaft extending longitudinally of the machine and spaced laterally from the first mentioned counter shaft, a spur gear meshing with the second mentioned spur gear on the first named counter-shaft, a worm carried by the second mentioned counter-shaft, a clutch controlling the operation of the second mentioned counter-shaft, a transversely extending drive shaft, a worm wheel carried by the transversely extending drive shaft, and engaging the worm, and sprockets secured to the ends of the drive shaft and designed to drive the rear wheels of the vehicle when the device is being used on the ground.

FOREIGN NEWS

ARGENTINE

Lieutenant Yerisso, a Uraguayan aviator was the victor in an international aviation race which started at Buenos Aires, Argentine, on July 16th and covered a distance of six hundred and forty-five miles. Army officers of several South American Republics started.

Lieut. Yerisso was later injured seriously by a fall at Mendoza.

FRANCE

The following is the official report for July 18th:

"Our aviators developed great activity during this period. They bombarded notably military establishments at Sofia enemy encampments at Monastir, Strumnitza and Bogdamie and Fort Rupel three times. An enemy squadron on the night of July 9 bombarded without result our encampments in the region of Topcin. Two enemy aviators were brought down on July 8 and 11, respectively, by our artillery and fell in flames within our lines."

On July 18th an enemy aeroplane was brought down by the fire of the French anti-aircraft guns near Braine, east of Soissons. The aviators were taken prisoners.

The official statement issued by the War Office July 22 reads:

"Contrary to the statement made in the communication of this morning, all the French aeroplanes which took part in the bombardment of the Metz-Sablons station have returned to our lines.

"One of our aeroplanes squadrons yesterday bombarded three times the railway station at Metz-Sablons, throwing 115 bombs of great size on the railway building and tracks. The bombardment must have caused great damage. In the course of one of these expeditions a German aviator who was pursuing our squadron was brought down. One of our machines was compelled to land after an accident and has not returned. This morning a German aviator dropped bombs on Belfort, causing neither casualties nor damage."

A report comes by way of London that the Allied aerial squadrons continue their activity along the western front. In the last few days French aeroplanes have carried out seven raids on railway stations and military establishments at different cities and towns held by the Germans.

The official French statement of July 23rd reports that great damage was done at most of the bombarded points by the 115 shells dropped.

In the air battle following a French raid on Muelheim four German and two French machines were shot down. The Germans replied to this attack by bombarding Belfort.

The French statement reads:

"In the day of July 21 our aeroplanes bombarded the station at Vigneulles, and in the night of July 21-22 the station at Thionville, where three great fires broke out; the station at Arnaville, and those at Laon and St. Erme. On the night of July 22-23 the station and military establishments at Thionville were again bombarded. One hundred and fifteen shells were dropped in the course of these expeditions.

"On the morning of July 22 a group of twelve French aeroplanes bombarded the military establishments in the town of Muelheim, on the right bank of the Rhine. A number of projectiles were dropped on the station and barracks, most of which are reported to have reached their mark.

"On the return of the expedition our aeroplanes engaged in battle with an enemy squadron. Four of the German machines were brought down and crashed to the earth. Two of ours were obliged to make a landing in the enemy lines.

"Last evening a long range enemy gun fired several shells of heavy calibre in the region of Belfort. This morning a German aeroplane bombarded the town, causing only material damage.'"

The German communication says:

"A French air squadron bombarded Muelheim, in Baden, and villages nearby. Two enemy aeroplanes were shot down in an air combat. We replied to the attack by bombarding the town of Belfort."

GERMANY

A list of the types, classes of motors and names of occupants of twenty-two French and British aeroplanes captured by the Germans on the western front last month was made public today by the War Ministry, which challenges the French and British authorities to publish details "in regard to German aeroplanes which our enemies pretend they have captured."

Since the beginning of the Somme battle the French and English are employing swarms of fighting aeroplanes to break up the German aerial reconnoissance, because troop movements and drawing together of huge masses of ammunition supplies are easily spotted by German fliers on the rolling plain of Picardy.

Germans praise the daring of enemy fliers, which is proved by the extraordinary number of twenty-two shot down behind the German front, but they contend that the Fokker fliers have established new records of superiority in a ratio exceeding two to one.

Air battles are being fought with increasing frequency, not only among men at the front, but far to the rear, as a result of the French and English air raids on German lines of communication. Every night last week on which weather conditions permitted enemy squadrons were in action, trying to drop bombs on railways, bridges and spots behind the German front. Early dawn has been a favorable hour.

The following is the official report for July 19th:

"German naval aeroplanes on the evening of July 18 bombarded enemy cruisers, torpedo boats, submarines and military establishments at the naval port of Reval. Numerous unquestioned hits were obtained on the enemy's forces. For example, one submarine was hit four times. Serious conflagrations were seen on the piers.

"In spite of the heavy fire by anti-aircraft guns and enemy aeroplanes all the German aeroplanes returned unharmed to the sea forces that waited outside the bay. Although the German sea forces were visible in the clear weather and the aircraft were able to locate them despite a fog that came on in the early morning, no sea forces of the enemy were observed."

The following is the official German report for July 22nd:

"Several of the enemy's air attacks caused only small miltary damage, but losses among civilians. At Laon three children were killed and one woman severely wounded.

"The enemy lost seven aeroplanes, four of them south of Bapaume, one to the east of Arras, one west of Combles and one near Roye. Lieutenant Wintgens disabled his tenth and Lieutenant Hoehndorff his eleventh aeroplane. The Emperor bestowed the Pour le Merite on First Lieutenant von Althaus, who conquered a French biplane near Roye."

RUSSIA

"In an aerial fight over the enemy's lines west of Dvinsk our aviators distinguished themselves," says the official communication of July 18th.

"Pilot Puchkel, with Observer Kovenko, while reconnoitring beyond Abeli, was suddenly attacked from the rear by a German Fokker. Kovenko was wounded in the hand, but our machine turned back and attacked the enemy, putting him to flight. Then our machine continued reconnoitring and completed its task.

"Beyond Rakishki the Fokker again attacked the same machine, successful shots causing much serious damage to the latter. Under the fire of machine guns the Fokker quickly disappeared, but soon returned and for the third time attacked our machine. Kovenko, notwithstanding his wound, plugged the hole in the radiator tube caused by the enemy's shot and prevented a disaster.

"He was wounded a second time in the stomach by a bursting shell, but, despite the serious wound, continued his work. He sat down at a machine gun and again began firing. The Fokker disappeared and Puchkel gradually planed homeward, arriving at the aerodrome with Kovenko, despite the cannonade."

The Zeppelin which recently raided Riga was hit several times by Russian anti-aircraft guns and wrecked near Tukum, according to a Central News despatch from The Hague, quoting reports received at Cologne.

The majority of the crew of the airship was saved and German engineers rescued the engine and other parts of the machinery.

SWEDEN

Two Swedish flight lieutenants, Mannstorem and Krus, were killed recently while engaged in a flight. Their aeroplane fell from a height of 300 feet.

Henri Farman type pusher biplane

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

THE NATIONAL MODEL AEROPLANE COMPETITION

From the following results of the National Model Aeroplane Competition it is apparent that a new world's record has been established for models launched from the hand. The credit for this accomplishment is due Mr. Thomas Hall, of the Illinois Model Aero Club, who succeeded in getting his model to fly a distance of 5,337 feet, more than a mile, surpassing the record of 3,537 feet, made by Mr. Wallace A. Lauder, of the Aero Science Club, during the National Model Aeroplane Competition of 1916.

The National Model Aeroplane Competition was instituted for the purpose of stimulating an interest in Aeronautics among the young men of the United States and judging from the reports of the various model clubs the Cause has thus far been successful. Although but two records have been established up to the present time many remarkable flights were made and the indication is that greater skill will be displayed during the coming competitions, especially with regard to mechanically driven models. During the June contest Messrs. Frank Schober and Fred. Thiele, of the Aero Science Club, made flights of ten and five seconds respectively. In a following contest Mr. Frank Schober flew his compressed air driven model a distance of 432 feet, thus establishing a record for compressed air models in the United States. Although reports for this contest have not been received from all the clubs it is barely possible that this record will be surpassed.

The results for the April, May and June contests follow:

Model News

RESULTS OF THE APRIL CONTEST.

DISTANCE FROM HAND

AERO SCIENCE CLUB OF AMERICA

New York City

	Best Flight			*Total*	*Average*
Egbert P. Lott	1779	212	200	2191	730
Frank Broomfield	1255	1120	299	2674	891.3
C. W. Meyer	2342 (Wrecked)			2342	780.6
Rudolph Funk	1966	1394	392	3752	1250.6
Club Total				10959	3652.5
Club Average					608.7

Judges—Messrs. Henry Woodhouse, L. D. Gardner, Baron L. D'Orcy, G. Douglas Wardrop, Ripley Bowman.

ILLINOIS MODEL AERO CLUB

Chicago, Ill.

	Best Flight			*Total*	*Average*
Ward Pease	4423	4225	3630	12278	4092.6
Willis Hitt	3238	3205	1490	7933	2644.3
Thomas Hall	5337	3133	60	8530	2843.3
Ellis C. Cook	206			206	68.6
Donovan Lathrop	219	80	31	330	110
J. J. Lucas	570	510	251		443.6
Club Total				1331	10202.4
Club Average				30608	1700.4

Judge—Mr. J. S. Stephens, Aero Club of Illinois.

TEXAS MODEL AERO CLUB

San Antonio, Texas

	Best Flight			*Total*	*Average*
Hamer Smith	2320′ 5″	2015	752′ 4″	5087	1695.6
Carl Gildemeister	1322′ 4″	1304′ 5″	935′ 9″	3562	1187.3
Merriman Smith	156 (Wrecked)			156	52
Club Total				8805	2934.9
Club Average					489.1

Judges—Mr. Thomas F. Mooney, care of Emmet Bank, San Antonio.

BAY RIDGE MODEL AERO CLUB

Brooklyn, N. Y.

	Best Flight			*Total*	*Average*
L. J. Bamberger	(Wrecked)				
W. F. Bamberger	1030			1030	343.3
William Heil	882	880	724	2486	828.6
H. McNickel	676			676	225.3
Club Total				4192	1397.3
Club Average					232.8

Judges—Comm. C. T. Fitzgerald, 2nd Bat., N. Y. N. M.

RESULTS OF THE MAY CONTEST.

DURATION FROM HAND

BAY RIDGE MODEL AERO CLUB

Brooklyn, N. Y.

	Best Flight			*Total*	*Average*
L. Bamberger	192	152.4	40	384.4	128.1
W. Bamberger	140.4	108.8	98	347.2	115.7
W. Heil	83	75.4	40	198.4	66.1
Harold McNickel	73	20	10.4	103.4	34.4
Henry Feichert	9	00	000	9	3
Ralph Olson	69	50.8	12	131.8	43.9
Club Total				1174.2	391.2
Club Average					65.2

Judge—Mr. John Jos. Shea.

Record of contest certified to before Notary Public.

ILLINOIS MODEL AERO CLUB

Chicago, Ill.

	Best Flight			*Total*	*Average*
Hittle-Hall	67.4	6.6	6.4	80.4	26.8
J. J. Lucas	35	9.4	7.6	52	17.3
W. Pease	122	39.2	8.2	169.4	56.4
E. C. Cook	155	146.2	122.2	423.4	141.1
D. Lathrop	108	62.6	6.6	177.2	59
W. Hitt	80.4	34.4	0.0	114.8	38.2
Club Total				1017.2	338.8
Club Average					56.6

Judge—(To be given later).

PACIFIC NORTHWEST AERO CLUB

Seattle, Wash.

	Best Flight			*Total*	*Average*
Atterberry Clyde	74.8	71	64	209.8	69.9
Robert La Tour	82	72.6	71.6	226.2	75.4
Clarence Minton	57	56.4	52.4	165.8	55.2
George Stoneham	65	64.8	64.2	194	64.6
Rene Valadon	70	48.6	42	160.6	53.5
No. Six	00	00	00	000	00
Club Total				956.2	318.2
Club Average					53.0

Judge—Mr. C. A. Guerard, Member of Aero Club of France.

TEXAS MODEL AERO CLUB

San Antonio, Texas

	Best Flight			*Total*	*Average*
Hamer Smith	85	20	5	110	36.6
Carl Gildemeister	39	15	7	61	20.3
Club Total				171	56.9
Club Average					9.4

Judges—(To be given later).

RESULTS OF THE JUNE CONTEST.

DURATION FROM GROUND

AERO SCIENCE CLUB OF AMERICA

New York City

	Best Flight			*Total*	*Average*
Curtis Myers	80	80	15	175	58.3
Charles Meyers	101	93	91	285	95
Wallace A. Lauder	94	90	2	186	62
Club Total				646	215.3
Club Average					35.8

Judge—Mr. N. Carolin, First Aero Co., N. Y. N. G.

ILLINOIS MODEL AERO CLUB

Chicago, Ill.

	Best Flight			*Total*	*Average*
Thomas Hall	114	87.4	80	281.4	93.8
Willis Hitt	68	53.8	4	125.8	41.9
William Schweitzer	105	96.8	91.6	293.4	97.8
Ward Pease	140.8	107.2	95.2	343.2	114.4
Ellis C. Cook	130.4	109.4	102.4	342.2	114
J. J. Lucas	55.6	45	20	120.6	40.2
Club Total				1506.1	502.1
Club Average					.83.6

Judge—Mr. James S. Stevens, Aero Club of Illinois.

RESULTS OF THE JUNE CONTEST

DURATION FROM GROUND

(Mechanically Driven Models)

AERO SCIENCE CLUB OF AMERICA

Frank Schober	10 Seconds
Fred. C. Thiele	5 Seconds

Judge—Mr. Edward Durant, Sec'y Aeronautical Society.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The X Y Z's of Aeroplaning

Don't worry whether there is gasoline in the tank or not, but if you must know, investigation with a lighted match will usually tell.

If your engine gets too hot an ice pack properly placed will allay the fever.

Punctured tires may be quickly repaired by a few mouthfuls of Wrigless Gum.

If your self commencer works don't be alarmed. Accidents will happen.

A properly set speedometer will increase the speed of your machine enormously.

Soft tread tires will enable you to land safely on rough ground.

When you put your engine together be sure to leave a few parts out for extras.

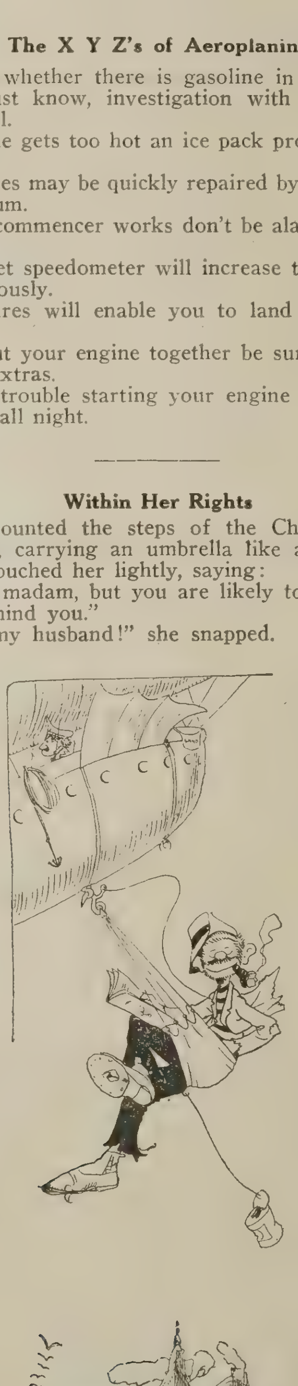
If you have trouble starting your engine on winter mornings, let it run all night.

Within Her Rights

A woman mounted the steps of the Chicago-New York airship express, carrying an umbrella like a reversed sabre. An attendant touched her lightly, saying:

"Excuse me, madam, but you are likely to put out the eye of the man behind you."

"Well, he's my husband!" she snapped.



"TRAMPING AIN'T WOT IT USETER WAS—THANK GOODNESS!"

Within the Law

Rural Constable—"Now, then, come out o' that. Bathing's not allowed 'ere after 8 a. m.!"

Hydroaerplanist in the Water—"Excuse me, sergeant, I'm not bathing; I'm only drowning."

Blissful Depravity

In a border southern town lives an elderly negro carpenter who is locally distinguished for his use of large words and his abiding fear of his wife, who is big, impressive and domineering. In this town a trio of young aviators keep bachelor quarters.

Not long ago one of the three called the darky in to do some small repairing.

"Boss," inquired the old man, in the midst of his work, "does you white gen'l'mens live heah in total depravity of de feminine sex?"

"We do," was the answer.

From the bottom of his henpecked soul the old darky fetched up a long, deep, sincere sigh.

"Well, suh," he said, "ef I wuz ez you is, I should suttinly remain so."

Got Out of It

Very proud in his new khaki uniform, the National Guard airman was walking around camp, and went to the butts, where some soldier lads were trying to hit a bull's-eye, but repeatedly missed.

"Here, boys," called out the officer, "I'll show you how to shoot." And he took a rifle, and missed. Having a good strain of Irish blood in him, his wits quickly came to his aid, and he smilingly remarked:

"That's how you shoot."

Taking a steadier aim, he fired again, and this time exactly pierced the bull's-eye.

"That," said he, triumphantly, "is the way I shoot."

Knows No Master

"I understand you have an aeroplane now," said the neighbor. "Do you drive it yourself?"

"No," responded Mr. Suburbs sadly; "nobody drives it. We coax it."

Very Good, Eddie!

He—"My father has just sent me an Airedale—shall we take it out for a run to-morrow afternoon?"

She—"Oh yes! Let's! I just love to ride in those foreign cars."

When driving in his aero
 The two could not agree;
She must have crowded him,
 For she said, quite saucily,
"You cannot work the clutch with me
 In here, my dear!"

As It Seems to the Aeroplane Owner

So gasoline is going up?
 The price gives me a pain,
Oh never mind we'll just drink oil,
 And feed the bus champagne.

The Don't Worry Club

"What has become of that 'Don't Worry Club' you once helped to organize?" said the helper to the air pilot

"Everybody refused to worry. The club got in debt and had to disband."—*Baltimore Sun.*

Miss Lowfly—I'm sorry I missed your wedding.
Miss Highfly—Never mind. I'll have others.—***Life.***

Thomas

Model D-2 Military Tractor

The fastest machine in America. Carries a load of 1,000 lbs. At a speed of 90 M.P.H., climbs 4,500 feet in ten minutes. **Guaranteed.**

Thomas Bros. Aeroplane Co., Inc., Ithaca, N. Y.

Curtiss

JN Twin Motored Tractor

Flies and Climbs on One Motor

SIX THOUSAND FEET—TEN MINUTES
TWO PEOPLE—FULL TANKS

THE Model JN Twin Tractor is unquestionably the most modern and efficient of military aeroplanes. Equipped with two Curtiss OXX-2 motors of 100 horse power each, it climbs 6,000 feet in 10 minutes.

THE CURTISS AEROPLANE CO.
BUFFALO, N. Y.

Our Aviation Service

(Editorial in Walla Walla (Wash.) *Bulletin*)

THE war department, for the past month, has been buying new aeroplanes at the rate of one a day. A few more months of this procedure will place our neglected aviation service on a footing where it can begin to build itself up to respectable strength.

No phase of our unpreparedness has been so discreditable as our failure to develop military aviation. It is absurd and humiliating that the nation that created the aeroplane should have been so slow making it serviceable to the nation. While our naval rank has sunk from second to third among the powers, our rank in aviation has sunk so low that we have scarcely any rating at all. The lessons taught by the war—the invaluable service rendered by aeroplanes for scouting and directing artillery fire, and even for bomb attacks and carrying provisions to beleaguered forces—have been neglected until lately.

The fault has rested mostly with congress, which has begrudged every dollar spent for this purpose. Now that the construction of an adequate aeroplane corps for the army and navy has begun, the government should stop at no half measures, but should provide an organization of air-men and aircraft as good as any in the world. The present popular interest in aviation will make the task easier.

The Aptitude of Aviators

A DESCRIPTION of a method which has been devised in France for physically testing those who desire to become pilots of aeroplanes is given by the Paris correspondent of the *Lancet* as follows:

"Some French observers have worked out a method of detailed physiological examination applicable to beginners in aviation, which has already met with high approval. In order to test the degree of self-control and of endurance the would-be pilot must begin by exerting with both hands a rhythmic and continued effort, which is inscribed on the tambour of an apparatus and automatically added up in kilos by a meter. He is then placed in front of a needle moved by clockwork one complete turn in a second. Immediately the subject is aware of any deflection of the needle he must arrest it by pressing on a lever. Finally, a tambour is applied to his thorax or to the pulse in order to gauge his respiratory and circulatory rhythm. He is then submitted to a violent and unexpected sensation, visual or tactile—a magnesium flash, a detonation, or a douche of ice-cold water. A rigid self-control may ensure no apparent emotion from the subject, but the tambour of Maret mercilessly registers the tremor of his hand, the acceleration of his respiration, the beating of his heart—in short, the organic impression. The organism thus betrays itself by the degree of its reflexes and in a manner more or less the persistence of its sensory response. A pilot should remain imperturbable not only morally but physiologically. In spite of fatigue, in spite of danger, his system must remain prepared to respond at once not only to the call of his will but to the reflexes acquired during his education and training. Like his machine, he must be a supple and unfailing organism. From the moment when his flight begins he must constantly adjust his apparatus to the three dimensions of space. If he misses the moment at which any inclination begins the necessary effort will become greater, because the acquired inclination will have had time to become more pronounced. Fatigue will also tend to increase, and to bring with it a muscular weakness which renders slower the production of the reflex. These two drawbacks form a vicious circle, and the moment will ultimately come in which the apparatus leans beyond the possibility of return.

"To sum up, what is essential for a good pilot is a combination in one person of resistance to fatigue, emotional passivity, and very rapid motor reaction, and these factors should be registered with precision in any tests to which the candidate is submitted. There is in this physiological examination, conducted in the way suggested above, more than an ingenious adaptation of medical knowledge to the needs of a special corps. The method offers guarantees for the individual and for the army as a whole, and if its employment becomes general may effect a real economy of men and material."

Aviators and Soldiers Find Wrist Watches Indispensable

Aviation and war have caused a radical reversal of the general opinion of wrist watches and their wearers. Formerly it was thought that the man who wore a watch on his wrist was the kind who was afraid of being slapped on the wrist—that he was an effeminate person, even a "sissy." But who would dare to put aviators, soldiers, surgeons, athletes and sportsmen in that class? Nowadays the masculine users of wrist watches are the manliest of men, and they wear them unashamed because such timepieces have become a necessity.

When men began to fly, they realized the need of knowing the time instantly. Before stabilizers were invented, aviators had constantly to use their hands, and even with stabilizers an airman finds it vastly more convenient to look at his wrist than to search in his pocket. From the beginning aviators wore wrist watches and the European war made soldiers realize the value of such timepieces. Among the troops in Europe the custom seems to have begun in the telephone and signal service, and it soon spread among the artillerymen and all classes of fighting men. Surgeons find wrist watches of invaluable aid in performing delicate operations. Reports from abroad now are that in the navy also the habit is spreading, and many civilians have adopted the idea. In America it has become a common thing for sportsmen on the hunting trail, in camp, or on the athletic field to wear wrist watches.

The chief danger in warfare has been from the breaking of the crystal, when parts of the shattered glass would fly into the eyes. Many attempts were made to overcome this defect. Grill or filigree work was placed over the dial, leaving the figures exposed, but this made accurate time-telling difficult. Then the old-fashioned hunting case was tried, but dampness in trenches soon rusted the springs. Celluloid glass was introduced, but in cold weather the crystals contracted and dropped off, the dials becoming scratched. Also, celluloid is inflammable, and the danger from its use was soon demonstrated.

An inventor then devised an unbreakable glass, clear and non-inflammable. It is also unshrinkable and dust proof. European manufacturers are turning these out in large numbers but not so fast as to supply the demand for them, and many ladies' wrist watches are being converted into military timepieces. This type of watch is being sought by American aviators who often find it difficult to obtain the right kind.

(*Continued from page* 596)

meter, clock, switch, magneto advance, gasoline pressure gauge, gasoline shut-off, circulator and emergency hand pump.

Power Equipment

Two Thomas Aeromotors, Model 8, each 135 horsepower. The motors are V type, four cycle, water cooled. Propeller driven through reduction gearing. Bore, 4 in., stroke, 5½ in. Motor r.p.m., 2,000. Propellers revolve at 1,200 r.p.m. Gasoline consumption for each motor, 14 gallons an hour. Each motor consumes 1 gallon of oil an hour. Weight of motor complete (with a Christensen starting system), 600 pounds.

Paragon propellers, 8 ft. diameter, 7′ 6″ pitch, weight 25 lbs. each, boss thickness, 6″. The complete power plant, including fittings, weighs 1,598 lbs.

Four hose connections are made from motor to radiator. Radiators form the front ends of the fuselages. A single centrifugal water pump is operated at crankshaft speed, providing cooling to both banks of cylinders.

Gasoline and oil are carried for a flight of six hours.

(*Continued from page* 601)

important of all the elements of the aero engine structure and the carburetor proper its most important apparatus, on which much work has been done, but more remains, especially of the adaptation order. (In this connection the paper by Dr. Karl Buchner on carburetion, which is one of the best, is reproduced in full in the appendix.)

Distribution of the mixture from the carburetor to the cylinder inlet valves without change of quality in transit, and in such a way as to insure a supply of mixture of equal quality to each cylinder, is a problem of equal importance to that of correct mixture making and is intimately associated with it. If the carburetor should yield correctly proportioned mixed and completely dry mixtures, this distribution header problem disappears, and any form of branch pipe will serve the purpose in place of the long elaborately curved headers now in use. Such mixtures are too warm to develop the maximum possible mean effective pressure. To get the greatest power output per cubic foot of piston displacement per minute requires a temperature lower than corresponds to complete dryness, probably corresponding to just such quantity of moisture as can be evaporated druing entrance through the inlet valve and, therefore, the aero engine header may be expected to carry some moisture.

Such mixtures have a tendency to separate the liquid, which resists division equally among the branches, and where vertical flow must take place there is a tendency for the liquid, which always flows along the walls, to drop back by gravity, to accumulate, and then suddenly carry over as a wave, causing a miss, especially at low-engine capacity. To prevent lagging of liquid, vertical pipes must be made so small as to produce skin friction forces superior to gravity at the lowest flow rates. If this is done then, at high flow rates, a considerable drop in pressure with consequent loss of power will result, unless, as is often the case, the carburetor is located at the highest point and the liquid allowed to drain downhill with the mixture current in large pipes. On reaching a bend the liquid flowing along the side walls always collects on the inside as the air stream impinges on the outside, while at a Y or branch the liquid may choose almost any path and is quite beyond control, for wherever the mixture velocity is locally least then the liquid concentrates and this point is constantly changing. The best that can be done is to use long-radius bends and flow paths to each cylinder of approximately equal length and curvature, but this gives no assurance of equal cylinders in line and eight cylinders V engines is evidence of an effort to reduce this trouble.

The only absolutely reliable way to avoid these special headers and the irregular engine action that results in two cylinders never doing quite the same work or remaining equally clean, is to completely dry the mixture by raising its temperature, accepting the higher temperature and lowered mean effective pressure in the interests of cleanly, steady operation, securing shorter simplified headers and possibly making up lost output by a small incrase in cylinder diameter or by raising the mixture pressure by blowers. There really seems to be considerable reason for the use of blower-supplied air for carburetors other than to compensate for loss of density when mixtures are warmed to dryness, which heating incidentally renders the engine more independent of variations of fuel quality than it now is. By suitable regulators the air blast can be controlled so as to give always the same absolute pressure at the carburetor intake, regardless of barometer or flight speed and direction. With such an auxiliary blower and pressure regulator, the friction effect of intake ports and small-diameter low-lift valves, while remaining a direct engine resistance, will have no effect whatever on the weight of charge per stroke and the mean effective pressures. Other things being equal, an initial pressure in the cylinder of 16, as compared with 14 pounds per square inch absolute, an increase of 2 pounds should increase the mean effective pressure and power one-seventh, over 14 per cent, while adding only 2 per cent additional load (if the mean effective pressure were 100 pounds), a net power gain of over 12 per cent if the blower be efficient. The use of such blowers is not unknown in two-cycle engines, though four-cycle engines have not employed them as yet, and the N. E. C. (New Engine Co.) two-cycle engine is so equipped, the blower in this case taking the place of a piston as a precompressor to prepare the charge for entrance into the motor cylinder when the port uncovers.

(*To be continued*)

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Pan-American Aeronautic Exposition to be Held in New York

PLANS are being made to hold the First Pan-American Aeronautic Exposition in New York from January 10 to 17, 1917, under the auspices of the Aero Club of America and the American Society of Aeronautic Engineers.

The Pan-American Aeronautic Exposition affords tremendous possibilities. It affords an opportunity to bring in this exposition the very best aeroplanes, motors and accessories we have and can produce, whether intended for military or utilitarian purposes or for sport, and to show these products to thousands of people who come to see them out of pure interest in aeronautics, and who are anxious to assist or participate in the developing of aeronautics on the American continent.

The organizing of the Pan-American Aeronautic Federation, consisting of the aero clubs of the ten largest American Republics, together with the fact that the budget for military aeronautics in the United States for 1917, promises to amount to close to $20,000,000, and the fact that aeronautics is rapidly developing as a sport, in the National Guard, and in the Coast Guard; and plans are being developed for the application of aircraft for mail carrying and other utilitarian purposes, give the Pan-American Aeronautic Exposition the substance necessary to make the event a great success.

Those interested in aeronautics in the different Pan-American Republics are enthusiastic over the prospect of holding any event which will develop aeronautics in their own countries, in anticipation of the aviation contests which are to take place at Rio de Janeiro in July, 1917, for which the Aero Club of America has offered a $10,000 Pan-American Aviation Trophy. Supporters of the movement to foster the development of Pan-Americanism have assured the Aero Club of America that they will give substantial support to this movement. Therefore, delegations from all Pan-American countries are assured. Whereas aircraft promise to solve difficult problems of transportation in South America, and the contests to take place at Rio de Janeiro represent the first steps taken to have the countries of the western hemisphere meet in joint sporting competition, the movement has a wonderful ethical background—and for that reason, official Washington is very much in favor of it.

The time set for this aeronautic exhibition, next January, is most propitious from a business standpoint. At that time of the year the score or so sportsmen who buy aeroplanes, such as Vincent Astor, Harry Payne Whitney, F. T. Davison, Howard S. Borden, W. Earle Dodge—these men now own aeroplanes and are probably ready to buy new models—are in New York. At that time the officers of the Militia of the dozen or so States, who are buying aeroplanes, will not be occupied with training men, and will be free to plan their purchases. By that time the Army and Navy will also have disposed of the details of reorganization of the Air Service—and will be able to send committees to inspect the exhibits. By that time the details of establishing the new aviation schools and recruiting the personnel for the Signal Corps, twelve Militia aero squadrons, and Aerial Reserve Corps, will also be settled, and the Army will be in a position to place large orders for aeroplanes, motors and general equipment. In the winter foreign buyers are also in New York, and the entire foreign commissions can come to see the exhibits, which makes it possible for them to place their orders there and then.

The aviators and prospective entrants in the Transcontinental Aeroplane Contest of 1917, will be planning their purchases and will be ready to place orders.

All the organizations and people who have co-operated to make a success of the popularizing of aeronautics and of getting the large Army and Navy appropriations for aeronautics, can be counted upon to make a success of the show. It is believed that it will be as successful financially to the exhibitors—who get fifty per cent of the profits—as the automobile shows are. The other fifty per cent of the profits will go, half to the National Aeroplane Fund of the Aero Club of America, and half to carry out the standardizing of the American Society of Aeronautic Engineers.

Following is the list om the members of the Organizing Committee, quite a number of the members of which have already written to Chairman Howard E. Coffin, accepted the invitation to serve:

THE MEMBERS OF THE ORGANIZING COMMITTEE PAN-AMERICAN AERONAUTIC EXPOSITION ARE AS FOLLOWS:

Chairman, Howard E. Coffin, Member of the Committee on Aeronautics of the Naval Consulting Board of the United States; Chairman of the Standardizing Committee of the American Society of Aeronautic Engineers.

A

Russell A. Alger, President, Aero Club of Michigan.
Roger Amory, Chairman, Executive Committee of the Harvard Undergraduate Aero Training Corps.
Gen. James Allen, President, Aero Club of Washington, D. C.
Ensign Vincent Astor, Commanding Officer, Aviation Section, Second Battalion, New York Naval Militia.
Bion J. Arnold, Member of the Committee on Aeronautics of the Naval Consulting Board of the United States.
Harry N. Atwood, President, Atwood Aeronautic Company.

B

Hon. John Barrett, Director General, the Pan-American Union.
Commander Frederic B. Bassett, Jr., U. S. N., in charge Naval Militia Affairs.
Captain Raynal C. Bolling, Commanding Officer, First Aero Squadron, National Guard of New York.
W. E. Boeing, President, Aero Club of the Northwest.
Marechal Borman, President, Aero Club of Brazil.
Cortlandt F. Bishop, Secretary-General, Pan-American Aeronautic Federation.
E. B. Brandee, President, Aero Club of Iowa.

C

Sr. Manuel Estrada Cabrera, President of Guatemala.
Roy D. Chapin, Citizens' Committee of Michigan Naval Militia Aviation Section.
Col. Charles Clifton, National Automobile Chamber of Commerce.
Glenn H. Curtiss, President, Curtiss Aeroplane & Motor Co.
Lieut. Greeley S. Curtis, Aviation Section, Massachusetts Naval Militia.
Robert J. Collier, Giver of the Collier Trophy.

D

F. T. Davison, Organizer of the Long Island Unit of the Aerial Coast Patrol.
Amador F. del Solar, President, Aero Club of Peru.
Col. Carlos Nunez del Prado, President, Aero Club of Paraguay.
Charles Dickinson, President, Aero Club of Illinois.

F

Benjamin S. Foss, B. F. Sturtevant Company.
Prof. H. C. Frankenfield, U. S. Weather Bureau, Member National Aerial Coast Patrol Commission.

G

Jorge Matte Gormaz, President, Aero Club of Chile.

H

Edward M. Hager, President, Wright Aeroplane Company.
John Hays Hammond, Jr., Member of the National Aerial Coast Patrol Commission.
Ensign Lee H. Harris, Commanding Officer, Aviation Section, Second Battalion, New York Naval Militia.
Major Carl F. Hartmann, U. S. A. Aviation Section.
James Hartness, President, Aero Club of Vermont.
Alan R. Hawley, President, Aero Club of America.
Representative Murray Hulbert, of New York, Member of National Aerial Coast Patrol Commission.

I

Hon. William H. Ingraham, Asst. Secretary of War.
J. C. Irvine, President, Pacific Aero Club.

J

Senator Chas. F. Johnson, of Maine, Member of National Aerial Coast Patrol Commission
Chas. A. Johnson, President, Aero Club of Colorado.
Dr. E. Lester Jones, Superintendent, U. S. Coast and Geodetic Survey.
Henry B. Joy, President, Lincoln Highway; Governor, Aero Club of America.

K

Representative Julius Kahn, of California, Member of National Aerial Coast Patrol Commission.

L

A. B. Lambert, Aeronautical Society of Missouri.

M

Dr. Richard C. Maclaurin, President, Massachusetts Institute of Technology.
Glenn L. Martin, President, Glenn L. Martin Co.
Alberto R. Mascias, President, Aero Club of Argentine.
Captain R. E. McMillen, Commanding Officer, Aviation Detachment, Nebraska National Guard.
Col. J. B. Miller, President, Aero M. F. P. Company.
Harry Bowers Mingle, President, Standard Aero Corporation.
George M. Myers, President, Aero Club of Kansas City.
Clarence H. Mackay, Giver of the Mackay Army Aviation Trophy.
Emerson McMillin, Member of National Aerial Coast Patrol Commission.
Brig.-Gen. Albert S. Mills, U. S. A., Chief of Division of Military Affairs.

N

Byron R. Newton, Assistant Secretary of the Treasury, Member National Aerial Coast Patrol Commission.

P

Chas. B. Page, Vice-President, Van Blerck Motor Co.
Rear-Admiral Robert E. Peary, Chairman, National Aerial Coast Patrol Commission.
Silvio Pettirossi, President, Aero Club of Paraguay.
Lieut. T. J. Pierce, Commanding Officer, Aviation Detachment, Rhode Island Militia.
Ralph Pulitzer, Institutor of the National Aerial Derby.
Raymond B. Price, Vice-President, U. S. Rubber Co.
Prof. Michel I. Pupin, Columbia University.

R

Alfred Reeves, General Manager, National Automobile Chamber of Commerce.
Earle Remington, President, Aeronautical Society of California.
Franklin D. Roosevelt, Asst. Secretary, U. S. Navy Department.
Naval Constructor H. C. Richardson, U. S. N.
F. H. Russell, Burgess Company.

S

Dr. Herbert C. Sadler, University of Michigan.
Joaquin C. Sanchez, President, Aero Club of Uruguay.
Alberto Santos-Dumont, President, Pan-American Aeronautic Federation.
Manuel Seminario, President, Aero Club of Ecuador.
John M. Satterfield, President, Aero Club of Buffalo.
Leland S. Scott, President, Hall-Scott Motor Car Co.
Commander Frank Simpson, Commanding Officer, Aviation Section, California Naval Militia.
Henry Souther, Engineering Advisor, U. S. Signal Corps.
Elmer A. Sperry, President, Sperry Gyroscope Company.
Lieut.-Col. George O. Squier, in Charge of Aeronautics, U. S. A.
Joseph A. Steinmetz, President, Aero Club of Pennsylvania.
S. W. Stratton, Director of the Bureau of Standards.

T

Lansing K. Tevis, Christofferson Aircraft Mfg. Co.
W. T. Thomas, President, Thomas Aeroplane & Motor Corporation.

W

Dr. W. D. Walcott, Chairman, National Advisory Committee, Secretary Smithsonian Institute.
Rodman Wanamaker, Governor, Aero Club of America.
G. Douglas Wardrop, Editor, AERIAL AGE WEEKLY; Managing Director, Aeronautic Photo and News Service.
Charles F. Willard, President, L. W. F. Company.
Henry A. Wise Wood, President, American Society of Aeronautic Engineers.
Henry Woodhouse, Member, Board of Governors, Aero Club of America; Director, American Society of Aeronautic Engineers; Educational and Industrial Delegate, Pan-American Aeronautic Federation.
Orville Wright, Scientific Delegate, Pan-American Aeronautic Federation.

Aero Club of America Appoints Delegates to Co-operate with Latin Republics in Developing Pan-American Aeronautics

TO co-operate more extensively and closely with the countries of the western hemisphere in the developing of Pan-American aeronautics, the Aero Club of America, at the request of Mr. Alberto Santos-Dumont, president of the Pan-American Aeronautic Federation, has appointed from its membership five delegates who will actively co-operate with the delegates of the other Latin Republics in the developing of Pan-American aeronautics.

The newly appointed delegates are:

Scientific Delegate, Mr. Orville Wright; Sportive Delegate, Mr. Alan R. Hawley, president Aero Club of America; Juridicial Delegate, Mr. Emerson McMillen; Military Delegate, Rear Admiral Robert E. Peary; Educational and Industrial Delegate, Mr. Henry Woodhouse, of the Board of Governors, Aero Club of America.

The Pan-American Aeronautic Federation considers all developments from the standpoint of Pan-Americanism. The Federation is a union of the Aero Clubs with control aeronautics in their respective countries, established for the purpose of fostering the progress of aeronautics, by uniting the various elements that work for the same cause on the American continent. The principal purposes of the Federation are given in its construction as follows:

(*a*) Spreading the knowledge of aeronautics by publications, conferences and having aeronautic exhibitions of all kinds. (*b*) Fostering the establishment of schools for training pilots for aeroplanes, balloons and dirigibles. (*c*) Fostering the establishment of schools for mechanics for aeroplanes and dirigibles. (*d*) Fostering the establishment on the American continent of aero-technical laboratories for testing and improving aeronautic material and conducting of all kinds of research. (*e*) Fostering the study of the atmosphere of the continent, in co-operation with the observatories of the different countries. (*f*) Fostering the making and issuing of aeronautic and topographical maps to be used in the service of aeronautics in different countries. (*g*) Establishing aerodromes and setting apart proper landing places for aircraft throughout the different countries. (*h*) Fostering the study of the history, theory and application of aeronautics pertaining to aerial navigation; including the publication of literary works on same and introducing the study of aeronautics in American universities. (*i*) Studying and analyzing the progress of aerial navigation in the different countries. (*j*) Explaining why military delegates are appointed from different countries. Mr. Henry Woodhouse, of the Board of Governors of the Aero Club of America, who discussed this matter with Mr. Santos-Dumont and other delegates to the Pan-American Federation, said:

"By including military delegates, it will be possible to evolve perfect co-operation and co-ordination of aeronautical resources which will be of utmost value for the maintenance of the Monroe Doctrine and the protection of the American continents from without. There will be, undoubtedly, the thousands of aeroplanes put in use for sporting and commercial purposes on this continent in the coming few years. As soon as there are ten thousand aeroplanes in use, the American nation will be in the position of the porcupine, which spends its days in peaceful pursuits, harming no one, but is ever ready to defend itself."

The News of the Week

Curtiss-Wright Amalgamation Delayed

Negotiations which have been in progress for the past two months, for the merger of the Wright Aeroplane Co. and the Curtiss Aeroplane & Motor Co., have been discontinued for the present.

It was found that an agreement could not be reached as to the basis on which each company would enter the combination. Both had development plans and contracts under way, the value of which, for purposes of calculating assets values, could not be readily ascertained until completed and experiments were carried out. It has, therefore, been decided that each company shall work out its own salvation separately, and that negotiations for the merger of the two companies be suspended until such time as these various matters are in position to permit of accurate estimates of values.

The Wright company has contracts for aeroplane motors for the Allied Governments; the Curtiss company has contracts with Great Britain for both aeroplanes and motors. No deliveries have yet been made on the Wright contracts, while a considerable proportion of the Curtiss contracts have been delivered.

Aeroplane Company Organized in Seattle

Articles of incorporation of the Pacific Aero Products company, a Seattle corporation organized for the manufacture of aeroplanes, and to conduct courses of instruction in aviation in the state of Washington, have been filed at Olympia.

William E. Boeing, James C. Foley and E. N. Gott are the incorporators. The company now has two plants in operation in Seattle. One of these plants, devoted to the manufacturing of the woodwork portions of the flying machines, is on Lake Union. The part devoted to the mechanical equipment and assembling of parts has been constructed on the Duwamish waterway.

In announcing the incorporaton of the company, E. N. Gott, who is acting as secretary until the regular meetng of the stockholders is held, declared that the company will engage in the manufacture and distribution of two kinds of aeroplanes in addition to conducting a practical school of aviation.

Messrs. Willard and Fowler Resign from L-W-F Company

Messrs. Charles S. Willard and Robert Fowler, who supplied the "W" and "F" of the L-W-F Engineering Co., of College Point, Long Island, have resigned as officers of the company and as members of the Board of Director. Mr. Lowe, the President of the company, will continue its activities. Messrs. Willard and Fowler have not yet announced their future plans.

Aeroplane Exhibition at Long Branch

The Summer Capital Fair, Aeroplane and Auto Show, which takes place at Long Branch during the first week in August at the Horse Show Grounds, promises to eclipse any event ever held on the Jersey coast. Notwithstanding the numerous attractions that are on the summer program this affair takes precedence over all others because of the fact that it is national in scope. During the past week space has been selling rapidly to numerous aeroplane manufacturers who are anxious to exhibit their machines before a large gathering of interested Army and Navy officials who are likely to be in the vicinity of Long Branch during this eventful week.

This is the first exhibit of its kind in the United States and it will prove a public education in aeronautics. It will bring many thousands of people to Long Branch.

All the aeroplanes will be housed under specially built hangar tents supplied by Thomas F. Martin.

Those who have already agreed to take space and others who have signed contracts to exhibit are the following: Harry N. Atwood, of Williamsport, Pa.; the General Aeronautic Co., of 110 West 40th Street, New York; The Aeromarine and Motor Co., of New York and Nutley, N. J.; The Wright Co., which will have a representative gathering of aero men; Overton Bounds, of Garden City; The Standard Aircraft Co., of Plainfield.

Harry Purdy, formerly connected with the Stewart Truck Co., of Philadelphia, is taking care of the aeroplane exhibits, and will have full charge of this end of the big show.

Overton Bounds, of Garden City, an instructor for the United States Aviation Corps, will bring down a new machine of the special exhibition type, in which he will loop the loop, do the spiral glide, vertical slide and the dangerous "Flying Leaf."

The star attraction is the blowing up of a dummy ship at sea, by Bounds. A boat of the scow type will be rigged up with fireworks which, when the bomb is dropped, will tear it to pieces.

Mr. Howard Huntington Resigns as Secretary of The Aero Club of America

Mr. Howard Huntington has resigned from the office of Secretary of the Aero Club of America, which he has held for more than two years, to accept the position of vice-president and construction engineer of the American Aircraft Company, which has been formed to undertake the business of aeronautics in all its branches.

It has always been Mr. Huntington's purpose eventually to

Beryl Kendrick, who has been engaged in passenger carrying at Atlantic City, last week put his flying boat to excellent use when he went in pursuit of sharks. He is here shown with a four-foot shark which he was successful in shooting

Mr. Howard Huntington, who has resigned as Secretary of the Aero Club of America to become Vice-President and construction engineer of the American Aircraft Co.

devote himself exclusively to the engineering side of aeronautics in which he feels most deeply interested, and in which he has already shown exceptional talent.

The American Aircraft Company is formed along broad lines, and Mr. Huntington has satisfied himself that this company is already in a position to undertake the work which he feels should immediatelv be started on a large scale. The comprehensive plans of the American Aircraft Company appeal to Mr. Huntington as presenting a wider opportunity for the practical development of aeronautics on definite lines than any that have yet come under his notice.

Mr. Huntington stated as follows: "As secretary of the Aero Club of America I have always given my best efforts toward awakening the public to the vital importance of aeronautics both for defensive purposes and commercial utility. I now feel it my duty to acept the call of the American Aircraft Company and to join forces with a group of strong business men who are bent upon bringing back the leadership in this great work of aeronautics to the country of its birth. My only regret is the severing of my relations with the Governing Board of the Aero Club."

At a meeting of the Board of Governors Mr. Huntington's resignation was acted upon and accepted with regret and resolutions of appreciation passed.

Kansas City Aero Unit in Training

The fifty men of the Kansas City Aero Squadron are in training at the Kansas City Athletic Club field for land drill. As soon as equipment is received their flying tuition will commence.

The officers and noncommissioned officers of the First Aero Company are:

Captain, J. A. Colvin; senior first lieutenant, Ralph R. Guthrie; flight lieutenants, George Quisenbery, William E. Roberts, Wallace C. Rue, Arthur Schritchfield and Walter C. Carswell; master signal electrician, Harry D. Betz; first-class sergeants, Howard Dailey and K. M. Blossom; sergeants, Oliver J. Mark, I. H. Beiser, Miles Blane, H. Davis and Cecil Condon; corporals, Rolland H. Fairchild, George Adar, Otto W. Geist, George H. Brooke, Harry P. Stark, George C. Launder, Jr.; Jacob T. Schless and George Merriweather.

Jacquith Flies from Philadelphia to Atlantic City

Kenneth Jacquith, son of a Chicago banker, covered 140 miles in a flying boat, July 27, in two hours and ten minutes. Starting from Essington in Philadelphia at 5:20, it was twilight when the aviator arrived and was greeted enthusiastically by a great throng when he landed in the Inlet.

The trip was made by a water route, going down the Delaware to Cape May and following the coast. He intended to try for the long distance altitude record, but flew at 3,000 feet after running into a blinding thunder storm.

"The trip," said the avitor, "was made without adventure of any kind. I had more speed, but took my time."

Robt. Glendinning Acquires New Flying Boat

Robert Glendinning, president of the Philadelphia School of Aviation at Essington, has sold his flying boat to E. Kenneth Jacquith. Mr. Glendinning has bought a new Curtiss flying boat, which will be delivered shortly.

Mr. Silas Christofferson, of the Christofferson Aircraft Co., with Lin Sun, representative of the Chinese Government, starting on a flight at Redwood City, Cal.

Second Aero Company, N. Y. N. G., Camping at Mineola with First Company

The Second Aero Company, New York National Guard, organized by Mr. John M. Satterfield, President, Aero Club of Buffalo, has been at the Hempstead Plains Aviation Field, which is controlled by the Wright Aeroplane Company, for a number of days.

This company has three licensed pilots, as follows: Willis Gregory Hickman, Ferdinand Eggena, Morgan Burkley More, and two who have not yet taken their licenses, W. P. Wall and Wm. C. Miller.

Thanks to the industry of Captain John M. Satterfield, the men were able to pitch a camp immediately on their arrival—which was during the rainy period,—and make themselves as comfortable as they could under the circumstances. Mr. Satterfield, being a banker, was able to meet such needs of his company as were not met by the State. For instance, when he asked for a number of pairs of pants and shoes for his forty-five men, and he received but half the number required—after almost two weeks of waiting—he promptly went out and bought what was needed. It took him only three hours to supply what he had been waiting for the best part of two weeks, and the State did not supply.

As in the case of the First Aero Company and the National Guard officers of different States who were brought to New York from Newport News, where they were training at the expense of the National Aeroplane Fund, the Second Company is suffering for lack of flying equipment. The Army appropriation has not yet gone through the House of Representatives, and in the meantime, the Army being penniless, cannot buy the aeroplanes needed for training. Altogether there are close to 100 men, including a score or so of men who get very high salaries in civil life, all waiting and wasting their time for lack of flying equipment. As the salaries of these men probably average over $10 a day in civil life, the loss of time alone may be estimated at $1,000 a day. Therefore, a number of machines could already have been bought with the money represented by the waste of these men's time.

THE ATLANTIC AIRCRAFT CO.'S TWIN MOTORED BATTLEPLANE

This machine has been designed by A. S. Heinrich with two Aeromarine 6-cylinder, 92 h. p. motors for a scout machine; it carries a fairly good useful load, has a high flying speed. It has been designed chiefly to get that combination which is so lacking in most of our present-day machines: "The high flying speed with a high climbing speed."

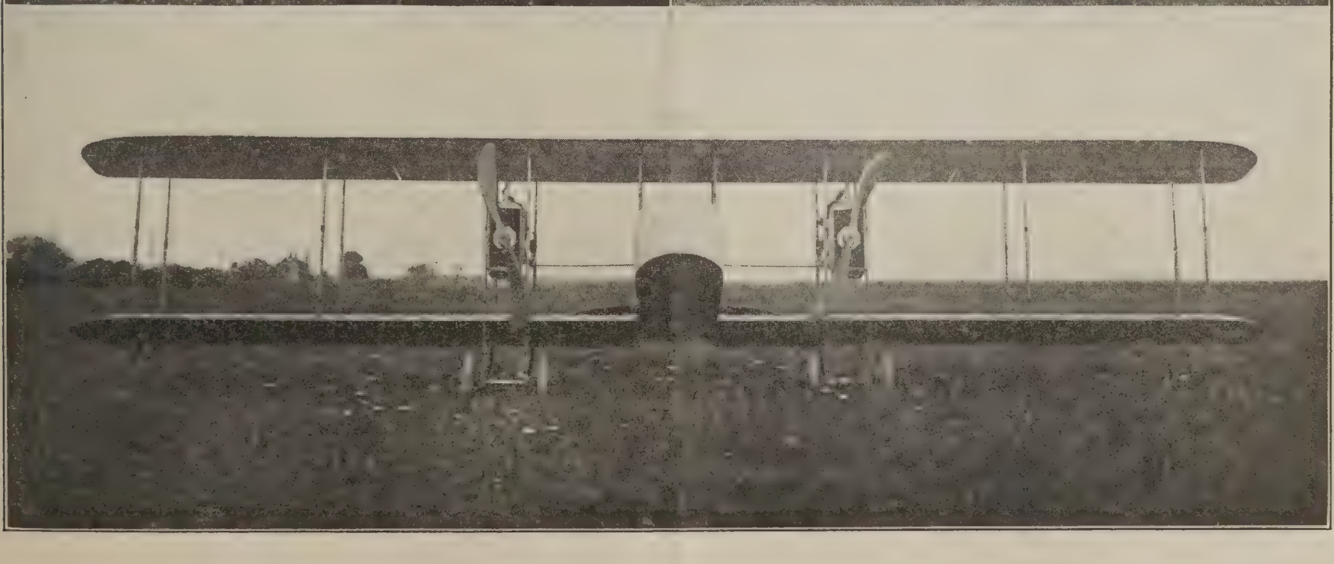
The high speed with full load is over 85 M.P.H., and the climb is three thousand meters in 18 minutes with full load. Provision has been made for a machine gun in front with an unobstructed range of 180 degrees. The minimum speed with full load is 50 M. P. H.

There is sufficient power in either motor to fly the machine with full load.

The machine is provided with one regular combination of rudders, one main or directional rudder and two auxiliary rudders, the auxiliary rudder being used only in case one of the motos are stopped or damaged, then the auxiliary rudders are given a permanent set against the motor which is running, this relieves the pilot from the strain of holding the rudder against the thrust of the motor which is running.

General Dimensions

Top Span	48 ft. 0 in.
Lower Span	48 ft. 0 in.
Chord	6 ft. 0 in.
Gap	7 ft. 0 in.
Length	28 ft. 6¾ in.
Height	11 ft. 0 in.
Area Main Planes	550 sq. ft.
Area Main Rudder	16 sq. ft.
Area Auxiliary Rudder (2)	20 sq. ft.
Area Stabilizer	40 sq. ft.
Area Elevators (2)	20 sq. ft.
Area Ailerons (4)	100 sq. ft.
Motors (2) 6-Cylinder, 92 H. P. each	184 H. P.



Burgess News

Howard S. Borden, of Oceanic, N. J., and New York, the prominent sportsman, has just completed his training course in aviation in one of the shortest periods on record. Mr. Borden's Burgess aeroplane, built at Marblehead, was delivered to him the first of last week and to-day he has already taken the machine out alone and unaided on an extended flight.

Clifford L. Webster, aviator of the Burgess Company, has been his instructor and has found his work greatly simplified by the natural aptitude of Mr. Borden, and the remarkable self-balancing qualities of the aeroplane which he used.

As an instance of the latter Mr. Borden last week after the arrival of his machine and before Mr. Webster had reached Oceanic, took the machine out for a trial run, intending to stay on the water. The seaplane had never been in the air nor had Mr. Borden ever flown an aircraft of any type. In speeding up the engine the machine gradually lifted its pontoon in the water until finally the embryo pilot was in the air before he knew it; a state of affairs which might have been considered extremely dangerous in a craft of the manually controlled type, and would hardly have failed to result in disaster. Mr. Borden had never had any practice in landing, and consequently knew no means of coming down other than by cutting off his engnie. This he did and the aeroplane descended easily to the surface after a flight of nearly one mile.

Since that time, under the tutorage of Mr. Webster, rapid progress has been made with several flights each day, until finally Mr. Borden, after instructions lasting altogether less than one week, has fuly qualified, as above stated, to handle the seaplane without assistance.

One unusual feature of the work occurred last Saturday, when for the first time on record an aeroplane appeared in front of a drawbridge with the request that it be allowed to pass. This took place after a flight over a yacht race in the bay when the aviators were forced to descend by a thick blanket of fog which rolled in and get a tow up the river to Mr. Borden's hangars. During this trip two drawbridges had to be opened to get access to the machine.

San Diego News

A new class in aerodynamics has been started at the military aerodrome under the tutorship of Lieut. Byron Q. Jones. At present six officers form the class. Lieutenant Jones recently took a post graduate course in aerodynamics at the Massachusetts Institute of Technology at Boston.

Seven of the officers stationed at North Island are now ready to take their junior military aviator's tests entitling them to field service. Orders from the war department instructing Colonel Glassford to proceed with these tests are expected soon.

Lieut. Herbert Dargue has reported at North Island and has assumed the duties as chief instructor, relieving Francis Wildman, who returns to his position as chief instructor of the flying boat and seaplane division.

Lieut. Walter W. Wynne, Twelfth cavalry, formerly stationed at Columbus, N. M., is the latest student to arrive at North Island.

Lieut. D. Johnson, Nineteenth infantry, and Lieut. M. F. Harmon, Twenty-seventh infantry, have successfully passed their tests for their Aero Club of America licenses.

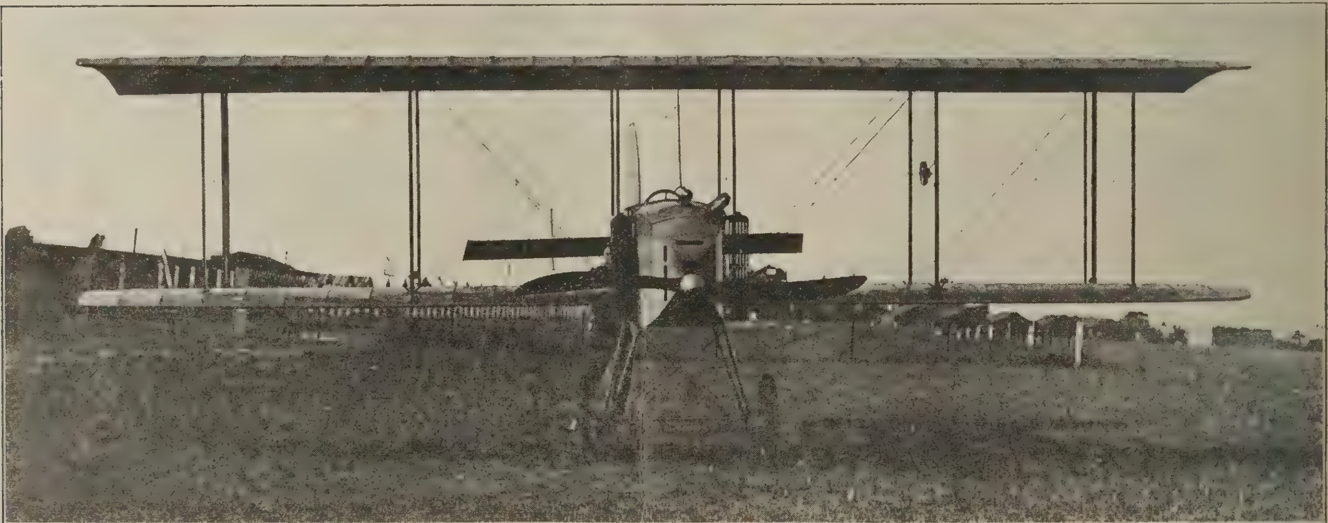
George Hallet, aeronautical motor expert, has been temporarily detached from North Island and ordered to the civilian training camp at Monterey as chief instructor of the aviation section.

Personal Pars

Russell B. North made daily flights at the Smithville, Mo., horse show, July 10-17, carrying mail from the grounds to North Kansas City.

A monoplane that will fly 100 miles an hour is to be built in Cleveland. Favorable action on application for patents will result in this new organization, according to Dr. C. M. Wanzer, of Urbana, inventor. With Charles P. Salen he is now promoting a $5,000,000 corporation.

C. M. Ludlow, aviator of the Robertson Aviation Co., of Miami, made flights at the big picnic at Seminoles, Fla., July 25th and 26th.



In our issue of July 10 we printed a full description of the Wright Model "L" tractor biplane. We have pleasure in supplementing this description with the above illustrations. The principal dimensions of this tractor are: Span, upper plane, 29'-0"; Span, lower plane, 29'-0"; Gap, 5'-8"; Chord, 6'-6"; Area, main planes, 375 sq. ft.; Tail area, 50 sq. ft.; Length over all, 24'-0"; Weight, net, 850 lbs.; Climb, 1st minute, 650 ft.; Motor, 60 h.p.

AEROPLANE PROPELLERS

By ELMER A. SPERRY

WITH regard to the ordinary wooden propeller, consisting really of a long club of wood adroitly shaped at its ends to cut perfect spirals in the air and develop a large forward thrust at high efficiency, as the power of aeroplane engines increase, we are from time to time hearing rumors of propeller troubles—for instance, one whole arm of a propeller recently broke very close to the hub. The sudden unbalanced condition that developed jerked the great 160-h.p. engine entirely out of the plane, and the wonderfully dexterous pilot succeeded in reaching the ground with his engine overboard and simply hanging on by "shoe strings," so to speak —a most remarkable exploit on the part of the aviator.

Now, what made this propeller break? It was nearly ten feet in diameter and was running 1,400 revolutions per minute at the time. Its weight was, say, 60 to 70 pounds, and its tip velocity something like 700 feet per second, developing an extremely high centrifugal force approaching 50,000 pounds for each arm. Each arm at the same time was delivering an axial thrust of about 500 pounds at a radius of about 3½ feet. 160 h.p. driving this member introduces a third, namely tortional, stress, which is of a low order as compared with the other two. These strains are all well known and recognized, and are all constant and persistent in their tendencies, and can be taken care of by providing sufficient cross sections and factors of safety.

But there is a fourth strain which is not usually understood in propellers and this is the gyroscopic lunge. Under conditions of the machine nosing, or turning, or being buffetted about, whenever it turns at an angular velocity of only a single radian the gyroscopic stresses rise to the value of about 2,750 pounds at the radius of a foot; but these stresses are peculiar, inasmuch as they rise and fall and reverse themselves. They are alternating in their nature, from full value in one direction to full value in the other direction fifty times a second. They go from zero pressure to full value every 1/100 of a second. This stress not only comes with full force upon the root of the propeller blade, but it also reaches the crankshaft extension, the radius of which is so small that it amounts to very large fibre stress in the shaft extension. It is a wonder [illegible]
and break it off. Constantly reversing as it does, these heavy moments are actually repeating themselves in the same plane with reference to the shaft, a condition which to the greatest extent lends itself to crystallization.

Some makers of propellers seem to confuse this gyroscopic stress with centrifugal force. They are entirely separate and distinct and super-imposed upon each other. To illustrate how utterly divorced these two forces are, one varies as the square of the velocity and directly as the radius, whereas the other, the gyroscopic, does not so vary but rather directly as the velocity and as the square of the radius. These stresses are instantly present and are always developed simultaneously with the pressed angular motion, and it should be borne in mind that the motion that develops these stresses is not restricted as to the plane. The stresses will be equally developed by pitching motion, either up or down, sidewise motion, or by motions in any other plane.

Now then, to come back to the breakage of the propeller in half, let us see just what all of these forces super-imposed are accomplishing. We all know that we can take a match between the thumb and finger of each hand and bend it to a considerable extent without fracturing it, but if while in the act of bending the match we at the same time pull strongly upon it, then it will snap, usually near one point of impingement.

We have seen how this propeller while under tremendous stress is consistently being bent backward and forward with tremendous vigor, which in all probability accounts for the breakage, because it is a known fact that the pilot at the moment the breakage occurred was in the act of making a reverse turn, in fact was turning to start home.

All designers of propellers, propeller hubs, and propeller shaft extensions will do well to bear all of these four stresses in mind, not neglecting the troublesome vibrating stress due to the vigorous gyroscopic moments present.

THE DEVELOPMENT OF THE SEAPLANE

THE illustration herewith presents in convenient form for reference the evolution of the seaplane from the earliest Blériot experiment to the period immediately before the war.

The machines are shown roughly in chronological order, but chiefly in order of their historical importance.

No. 1 was a tractor biplane built somewhere in 1908 by M. Blériot and fitted with pontoons. This machine used to be towed on the water by the racing motorboat, "La Rapiere," in the hopes that once off its engine would be sufficiently powerful to fly it. The hope was not justified.

No. 2 was the first Curtiss water machine, and the first aeroplane to fly off water. Its first flight was in January, 1911. This was very much on the lines of the 1909 Curtiss Gordon-Bennett machine. The front elevator, which apparently was intended to act also as a water-damper, should be noted.

No. 3, the Fabre monoplane, was like nothing built before or since, except the contemporary Fabre-Paulhan land biplane. It is chiefly notable for being the first water-machine to fly in Europe. It got off the waters of the Mediterranean and promptly fell in again.

No. 4, the Gnossplius monoplane, was the first British waterplane with which experiments were seriously made. Short flights were made with this machine over Windermere in 1911. This is another machine of the single float variety.

No. 5, the twin-float tractor Avro with 35-h.p. Green engine, was used for experiments at Barrow-in-Furness by Commander Schwann, R.N. (now Captain R.N.A.S.). This machine, which was flown by Mr. Sippe (now Flt.-Comm. R.N.A.S.), was really the prototype of the hundreds of twin-float tractor seaplanes now in use. It was the first machine to fly off British seas.

No. 6 was the Voisin "canard." This somewhat singular machine evoked a good deal of derision when it was first produced, but, nevertheless, it did some quite sound flying both on the Seine and at Monaco. The particular machine illustrated was an amphibian, having wheels to permit it to alight on the ground, which it did quite successfully.

No. 7. This twin-float Short biplane was a converted land machine, and paved the way for many other of the Short productions, of which it was the ancestor.

No. 8, a single-float Short tractor, did an enormous amount of flying. The two small balancing floats on this machine naturally came into operation a great deal when the machine was traveling on the water, and eventually the single central float was discarded, as it made it impossible to manœuvre on water at low speeds.

No. 9, a single-float Curtiss biplane, was built on the lines of the then existing Curtiss box-kite. A number of these machines were sold to the Russian and Japanese Navies, and did much hard service.

No. 10 was a Curtiss flying-boat with overhead engine. This was the pioneer of an entirely new class of seaplane. Machines of this type did a vast amount of flying in America on the rivers and Great Lakes, and quite a number were purchased both by private sportsmen in Europe and by the different Air Services.

No. 11, a 100-h.p. Gnôme twin-float Avro biplane, was the first seaplane of this make to be really successful. This machine was purchased by the Imperial German Navy and was the first unit of the German aeroplane fleet to fly to Heligoland, a considerable time before the outbreak of war.

No. 12 was the 80-h.p. Borel seaplane. This machine was the first hydro-monoplane to attain any success, although its short radius of action and limited climbing capacity did not allow it to survive long. A large number of these were used in 1913 by the R.N.A.S. and were very valuable as training machines.

No. 13 was the Sopwith Green-engined "bat-boat," a flying boat which attained very considerable success. It was awarded a prize offered by Mr. A. Mortimer Singer for the first all-British machine to make a series of starts and alightings alternately on land and water. It also was the first of a new class of seaplane which has not yet reached its full development.

No. 14 shows an amphibian Albatross "Taube" monoplane. This machine had a considerable measure of success, beating all competitors in the Italian Waterplane Competition, but it never distinguished itself as a seaplane. A clear distinction must be drawn between a "waterplane" for lake and river work and a seaplane for rough water.

No. 15 was the 200-h.p. Salmson Bréguet. This machine as an engineering job was one of the finest seaplanes ever built, but it, of course, had the inherent shortcomings of other Bréguets in its wing design. Flown by M. Moineau at Monaco it performed wonders in getting off and alighting safely on the most fearsome seas, and a full "mistral," with a wind-speed of 60 miles an hour.

No. 16 was the Sopwith tractor biplane fitted with Green engine on which Mr. Harry Hawker made his attempt to win the £5,000 *Daily Mail* prize for a seaplane flight around England, a flight which terminated on the Irish Coast owing to a side-slip in alighting.

No. 17 was a Caudron amphibian biplane with wheels let into the centre of the floats, offering the minimum of resistance in the air, but too much in the water to allow it to get off with full load.

No. 18 was the Nieuport monoplane. This machine, which is built with a perfectly rigid chassis, has done some very useful flying, particularly on active service with the French Navy. It is notable for the curious "ears" intended to prevent the floats from "nosing under" when alighting.

No. 19 was a Blériot water-monoplane, so constructed that it could be readily converted into a land machine by removing the floats and fitting wheels, the major portion of the chassis being equally suited to either purpose.

No. 20 was a small Morane monoplane on which M. Garros did much magnificent flying in the Monaco Meeting of 1913.

No. 21 was a Sopwith "tabloid" seaplane with 100-h.p. monosoupape Gnôme. On this machine Mr. Pixton acquired fame by winning the "Schneider Cup" at Monaco in 1914, when he defeated the leading French aviators. This was the first international coup acquired by any British aeroplane.

No. 22 was the Sopwith pusher biplane adopted largely by the Royal Greek Navy. This machine was fitted with a 100-h.p. Anzani.

No. 23 was the 160-h.p. Gnôme pusher Short biplane to seat four, on which Mr. Horace Short, Mr. Alec Ogilvie and Mr. Frank McClean made a journey up the Nile to Khartoum.

No. 24 shows the Short tractor biplane, now a standard type, with folding wings which can be opened and closed from the passenger seat. These machines are particularly useful for work with a fleet, as 5 machines can be stowed in a space occupied by one with its wings extended.

No. 25 shows the Zeppelin amphibian, built by the Friedrichshafen Aeroplane Co., a branch of the Zeppelin Airship Co. This machine attained considerable success in the German Lakes Competition.

No. 26 shows the standard 100-h.p. Gnôme Henri Farman. This machine was contemporary with the Monaco "Rallye" of 1914. It was fitted with floats to which the chassis members were attached by a spring device so that alighting shocks are well absorbed.

We are indebted to the *Aeroplane* (London) for the illustration.

Carburetor Standardization

The United States military and naval aeronautic service will have a standard carburetor equipment for all engines, if the National Advisory Committee's plans are carried out. The committee has appointed Prof. Charles E. Lucke of Columbia University as chairman of a commission to ascertain the carburetor best suited to the needs of the aeronautical service.

The Master Carburetor Corporation last week received a letter from Prof. Lucke, asking them to forward him their carburetor in all sizes, that he might study it at close hand, and make a detailed report on its construction. This was done at once by the Detroit factory.

Prof. Lucke will spend several months in the study of the carburetor, and will finally decide which carburetor is best suited to the needs of the American aeroplane service. This carburetor probably will be accepted as the standard for the service.

Capt. McMillen Flies Over Lincoln at Night

Captain Ralph McMillen of the Nebraska National Guard aviation corps, made a spectacular night flight over Lincoln, July 23, under conditions as nearly possible like modern warfare as he could secure.

Captain McMillen has been making daily flights during the past week working out different problems assigned him by the adjutant general's office.

FOREIGN NEWS

AUSTRIA

The Austrian War office issued the following bulletin on July 25th: "Our naval air squadrons bombarded military establishments at San Giorgio, Dinogara, Gorgo and Monfalcone, causing fires to break out. Our aeroplanes returned undamaged."

FRANCE

The following official communication was issued on July 28th:

"This morning our aeroplanes pursued a German air squadron in the region of Verdun. Several fights occurred, in the course of which one enemy machine was forced to come down within our lines and two officers were made prisoners."

In a hot aerial fight over the Verdun battlefields on Saturday, July 22nd, Corporal Dudley Hill, of Peekskill, N. Y., a volunteer pilot in the French aviation service, forced a German aeroplane to land precipitately on the shell-torn ground directly behind the German lines at Fort Thiaumont. For this feat he has been nominated for the grade of sergeant.

Lieutenant de Laage, Sergeant Kiffin Rockwell and Corporal Hill were on patrol duty over the battle ground, flying at a great height, when they saw three German machines in the distance. They flew at once toward the hostile machines. Two of the German aeroplanes fled while Hill, who was in the lead, gave battle to the third. The German was evidently hard hit by the American's first volley, for he immediately dived to the ground, unable to make his regular landing place.

Corporal Hill, who is a former Cornell University student, came to France early in 1915 and joined the American field ambulance corps as a volunteer driver. After a few weeks, wishing to see some real action, he resigned and went to a training school for war pilots. He went to the front two weeks ago to replace Sergeant Clyde Balsley, of San Antonio, Texas, who was lamed for life by a German bullet, which entered his thigh and exploded. Since going to the front Hill has had several combats with enemy planes, and has proved himself a courageous fighter.

Adjutant Bert Hall and Sergeant Rockwell had a thrilling battle with five German aeroplanes last Friday. They departed together for a special sortie over the German lines in the Verdun region. They flew far above the enemy's territory at an altitude of about 3,500 yards, when Rockwell sighted an Aviatik immediately below. He immediately swooped down on the German plane, facing a hot fire from its machine gun. Rockwell held his fire until he was within ten yards of the foe.

After a few shots from the French machine gun the German aeroplane fell straight toward the earth, disappearing in the clouds of smoke and dust that arose from the battlefield.

Meanwhile two Fokkers had dived after Rockwell, shooting at him from above as he battled with the Aviatik, Hall arrived at this time and gave battle. Two additional Fokkers flew up and joined in the fray. In line of battle the two French aeroplanes and four Germans went down through the air some 2,000 yards, exchanging volley after volley from their machine guns. The American pilots having discharged their disks of cartridges and being outnumbered by the Germans dodged into the clouds, eluded their foes and flew safely home with many bullet holes in their machines.

Didies Masson, of Los Angeles, who also is in the American escadrille, has been promoted to adjutant. He was the only aviator in the Mexican army, and for some time flew for Villa when the latter was fighting Huerta. Masson held the rank of captain in Villa's forces.

Norman Prince, Kiffin Rockwell and Lieut. De Laage fought a thrilling battle in the air with three German aviators behind the German lines on Tuesday, July 25th, according to a dispatch received from the front on July 27th.

While Prince and De Laage fought two of the Germans, Rockwell dived under the third machine and attempted to cut off its tail. The fire from his mitrailleuse raked the German machine from tail to motor. Rockwell, however, had two scares, one when he missed by inches striking the German with his propeller and the second when, in the course of the manœuvring, he found himself facing the enemy's mitrailleuse. It was an uncomfortable second, he relates, until he discovered the operator was sitting dead at his post.

The official communication issued by the War Office on July 24th reads:

During the night a German aviator dropped bombs on Luneville. One person was wounded. Sub-Lieut. Chaput brought down yesterday his eighth enemy aeroplane, which fell near Fresnes-en-Woevre. A second German machine attacked fell near Fort Vaux. On the night of July 22-3rd and during the day of July 23rd our aeroplanes dropped eight shells upon the railroad station at Conflans, forty on the barracks near Vigneulles and twenty-five upon the aerodrome at Dieuze.

Calm prevailed on the rest of the front. One of our pilots, Sub-Lieut. de Lorme, already cited six times in army orders, is again cited because of a series of bombardments carried out by him on stations held by the enemy.

Two pilots of the American escadrille—Sergeant Kiffin Rockwell and Adjutant Bert Hall—finding themselves trapped by five German machines over hostile territory July 21st, perpetrated a Yankee trick on the enemy and slipped back to the safety of their own lines.

Rockwell and Hall during the afternoon spied an aviatik flying alone and immediately rose in their Nieuports, eager for battle with this latest type German aeroplane. It was a new model of an old aviatik, capable of high speed and carrying two men and two machine guns.

Rockwell arrived near the enemy first and, circling, riddled him with machine gun fire. Although it did not kill the pilot, it pierced the aviatik in a vulnerable spot and forced the German to descend. Rockwell, watching the machine fall, did not realize that two Fokkers were behind him until the wings of his Nieuport were riddled with bullets.

Hall immediately joined battle, but a few minutes later a third, then a fourth and a fifth Fokker closed in on the pair of Americans, who found the battle growing too hot for them, with no chance of reinforcements and far from the home lines.

Then came the Yankee trick. The Americans were fighting about 8,000 feet in the air and a heavy cloud bank was near them. Manœuvring into this bank, they dove out of sight, leaving the enemy machines on the other side of the thick veil, unable to reach their prey.

Eventually the pair arrived home, their machines wet with mist and scarred with bullets, but safe.

Another American, Paul Pavelka, has just been ordered to join the escadrille and leaves for the front to-morrow.

GERMANY

Lieut. Otto Parschau, who won the Order Pour Le Merite for bringing down his eighth enemy aeroplane, has been killed in an air battle, according to a dispatch.

A German Naval aeroplane on July 25th attacked the main base for Russian and British submarines at Mariehamn, it was officially announced by German authorities on July 26th. The aeroplane bombarded the port successfully, it is added, with 700 kilograms of explosive bombs. Although the aeroplane was shelled, it returned to its port undamaged.

A Zeppelin airship was sighted off the Swedish coast on July 25th that appeared to be a new and larger type than those previously used by Germany. The Zeppelin had three cars below the gas tanks.

The official bulletin given out on July 26th is as follows:

"Two enemy aeroplanes were brought down within our lines north of the Somme by infantry and machine gun fire. One aeroplane, after an aerial battle, fell to earth in a burning condition in the vicinity of Luneville. On Monday a French biplane was shot down in the direction of Fort Couville by a direct hit from our anti-aircraft guns."

Regarding operations on the Eastern front, the official statement says:

"Our airmen by dropping bombs and by their machine gun fire compelled enemy troop transport trains on the Dvinsk-Plock Railway and east of Minsk to come to a standstill.

"German aerial squadrons successfully dropped numerous bombs on the railway stations of Pogorielzy and Horodziaja, where troop trains were standing, and on troop camps in the vicinity of these railway stations."

A German Admiralty report on July 27th announces a successful raid by German aircraft on the Russian aerial station at Oerelon Island of Oesel, off the Gulf of Riga. The statement says:

"A German air squadron, on July 25th, attacked and bombarded the Russian aerial station at Oerelon, Island of Oesel. Aerial sheds and aerial planes which were ready for flight were struck. Although heavily shelled by the enemy's torpedo boats and battle-planes, the German attack was methodically carried out and all our air craft returned undamaged."

A British biplane was shot down by a German submarine at a point north of Zeebrugge, Belgium on Monday, the 24th of July, says an official statement issued by the German Admiralty on July 27th. The two officers in the aeroplane were captured. The text of the admiralty statement follows:

"On the afternoon of July 24th, a German submarine by its fire brought down to the sea a British biplane. The occupants, two officers, were made prisoners by a German aeroplane, and were transported to Zeebrugge on board a torpedo boat."

According to information from Berlin, the Crown Prince of Germany made his debut as a military flyer last week. For fifteen minutes the heir to the German throne risked his life in a German aeroplane over the French lines surrounding Verdun.

While admiring this fresh proof of the Crown Prince's courage, considerable adverse comment was heard in Berlin, the Germans holding that as heir to the Emperor, Prince Frederich Wilhelm should not needlessly risk his life in such dangerous exhibitions of courage.

It was pointed out that before the war the Kaiser had always prohibited his eldest son from assuming such risks.

GREAT BRITAIN

On July 22nd German aeroplanes made a raid on the coast of England, according to an official statement:

"The number of raiders," says the statement, "has not yet been established. The reports as to the raiders crossing the coast come from Yorkshire and Lincolnshire. Bombs were dropped, but details are lacking."

The most radical aviation development since the war began is embodied in the new Sopwith one-seater aeroplane, which has shown a speed of 120 miles an hour at high altitude. It is a triplane of small wing area, provided with a 110-horsepower Clerget rotary motor, which actuates a tractor screw. The triplane, which will be especially useful for attacking slower machines, mounts a rapid fire gun arranged to shoot through the propeller by synchronism with the motor.

RUSSIA

The following is from the Russian official report of July 27th:

Baltic Sea.—On Tuesday evening a Zeppelin dropped fifteen bombs at the mouth of the Gulf of Finland and on the outskirts of the town of Abo, in the Aland Islands, without damaging the ships or shore. Shelled by our batteries the Zeppelin disappeared southward.

"The same day eight enemy waterplanes attacked our waterplane station, dropping 100 bombs. Two of our waterplanes engaged the enemy, hitting one machine, which caught fire."

AERO ENGINES ANALYZED

By CHARLES E. LUCKE

(*Continued from page* 610)

All two-cycle engines and all rotating cylinder four-cycle engines with inlet valves in pistons have mixture quality and supply conditions somewhat different from those of the four-cycle fixed-cylinder engines, and among the latter the air-cooled differs somewhat from the water-cooled group. The cylinder heads of four-cycle air-cooled engines are normally hotter than those that are water-cooled, so that the mixture entering will receive more heat and may, therefore, be more wet as supplied, provided distribution from the carburetor is not a disturbing element, as, for example, if each cylinder had its own separate carburetor. If cylinders are not too large and the air cooling is vigorous it is possible to get the walls of the air-cooled cylinder quite as cool as the water-cooled one but only with excessive power consumption for air circulation, the Renault, for example, taking 8 per cent of its output for only such cooling as is normally provided. Most of the rotating-cylinder four-cycle engines with inlet valves in the pistons, including the Gnome, for example, take their mixtures into the crank case at the shaft center. In this crank-case chamber, which is rapidly whirling, with pistons churning up and down at the same time, a most vigorous stirring and heating action takes place. It would be hard to conceive of a better mixture conditioning apparatus than this Gnome crank case, provided there were some means of control of the temperature of the mixture, which in this case undoubtedly gets too warm, though dryness and homogeneity are practically perfect. Finally, two-cycle engines take the mixture from the carburetor into an auxiliary chamber for precompression, located in the crank case as the most favorable arrangement, or in a trunk enlargement of the main piston and cylinder preferably, as, for example, in the Laviator engine. While, of course, this precompression mixture has the evil effect of imposing negative work, equivalent to engine friction, it is highly beneficial as to mixture quality when the precompression chamber is so located, as is usually the case, as to get and stay warm, because in this case the chamber is at once a mixture stirrer and heating dryer, heating partly by wall contact and partly by compression.

Mixture treatment in the cylinder after it has been made and delivered to the intake port, begins with actual entrance and proceeds along different lines in the two and four cycle engine, in some respects. Nearly all aero engines are four-cycle engines, and these take the mixture in through a suction valve under the influence of the lowered cylinder pressure maintained by the piston outstroke. This admission should be accomplished with the least possible loss of pressure and rise of temperature. Loss of pressure imposes direct negative fluid friction work, the extent of which is measured by the velocity of flow through the valve, and the shape of the opening, but even with small valves and badly shaped openings or ports, this loss may be, but not often is, very serious. Two pounds per square inch would be large and with mean pressures approaching 100 pounds it would be equivalent to a little over 2 per cent. However small it may be, it can be controlled by valve and port dimensions and these, because of the high speed of aero engines, must be given far more attention than in any other class. It is the terminal pressure at the end of the suction that is one of the determining factors in the weight of the charge, each pound per square inch accounting for about 7 per cent loss of power. Such inertia of the incoming stream tends to build up the terminal pressure over the mean suction pressure, if valve closure is delayed the right amount, the value is so great that care must be exercised to secure it, and Winkler recommends a closure 40° after dead center. This delayed inlet valve closure can be secured only by mechanical inlet valve which also give best control over the mean suction resistance, so that under no consideration should automatic inlet valves be employed, as they have been, to save valve gear weight, because more power is lost than would compensate for this weight. Charge density at the end of suction is just as much a matter of temperature as of pressure, a rise of about 500° F. on entrance accounting of itself for about a 50 per cent reduction of charge weight and hence of power output, or approximately 1 per cent for every 10° rise, with the probability that the rise averages in well-cooled engines somewhere about 200°, or 20 per cent, and in the less well-cooled ones over 300°, or 30 per cent, in general round numbers.

Reduction of suction heating is partly a question of arrangement and partly of wall cooling but to some extent depends on the temperature of the hot gases left in the clearance after the previous explosion. As to arrangement, head valves discharging mixture directly into the cylinder seem to be more rational than side-pocket valves, though no data are available to prove that the former results in less suction heating than the latter. It also seems likely that air-cooled heads and valve chambers unless vigorously air blasted and of small chamber should heat the mixture more than water-cooled ones, but no one has ever determined how small a diameter can be equally well cooled by air and water nor how much air is needed. Nor can it be said how much of the total suction heating is due to exhaust gas mixture in the clearance with the fresh incoming charge. It is interesting to note that the air-cooled radial fixed cylinder Anzani gave in the tests 99½ pounds square inch effective pressure referred to brake horsepower, as much as most of the water-cooled engines.

Not only is it important that the charge in the cylinder be as cool as possible for the maximum charge density required for high mean pressures, consistent, of course, with complete vaporization, for which 120° F. is enough with gasoline if the mixture is well stirred, but it is perhaps even more important as the controlling factor in the permissible compression. This degree of compression of the charge before ignition is the prime variable in fuel consumption per horsepower hour and thermal efficiency, as has been demonstrated conclusively both by thermodynamic analysis and experimental data on all classes of internal-combustion engines. The highest compression possible must be obtained at all costs, and since it is the ignition temperature of the mixture that imposes a limit the objective of the engine designer must be to so treat the mixture as to get the maximum compression volume ratio and final pressure before the mixture being compressed reaches the ignition temperature which is a physical constant of the mixture, never accurately determined but probably very close to 935° F. This compression for the best water-cooled engine has been found to be about 5 to 1 volumes and less for cylinder not so well cooled. Of course, self-ignition before compression is complete will occur if any metal part, such as the exhaust valve or piston head, or a carbon deposit, is overheated, because this will produce a local overheating of the charge in contact with the hot spot before the whole mass has reached the ignition temperature. Prevention of this is a matter of engine cooling and of the internal cleanliness that comes with proper lubrication and carburetion. Assuming such to be properly cared for, the compression permissible with gasoline mixtures is fixed by the initial temperature of the charge. The final temperature varies with the initial in a geometric ratio, as is indicated by the standard equation for adiabatic compression, so a few degrees rise initially results in several times as great a terminal rise.

Charge weight per cubic foot of suction must be a maximum, and so also must the compression, if the mean effective pressure and thermal efficiency are to have the highest possible value, as they should in aero engines. All efforts in this direction may be entirely defeated, however, if there is any material leakage of the charge during compression through valve seats or past the piston. It is of no value to secure maximum charge weights during suction if appreciable amounts are afterwards lost before the charge has a chance to do any work. Tightness of piston depends on the piston rings, on the oil film between piston and cylinder, and on the maintenance of shape of cylinder and piston, neither of which may warp in any direction. Valve leakage likewise is minimized by providing nonwarping valve disks and seats with strong spring loads to keep the valve tightly against its seat during the first period of compression; at other times the gas pressure itself will suffice. These are questions of form and materials and will be taken up later, but they are mentioned here because a failure means defeat of the results of an otherwise well-executed suction process.

Four-cycle engines, after the suction periods, have their charges directly in the cylinder ready for compression and subsequent ignition. Two-cycle engines must put the charge through the preliminary compression process in a precompression chamber where the mean pressure of precompression must be added to that of suction, the sum of the two subtracted from the mean effective pressure of the compression and expansion strokes to get the net available. Therefore, assuming equal performance of the compression and expansion strokes, the two-cycle engine is charged with more negative work than the four-cycle by the amount of the precompression stroke, assuming equal negative work of suction in each. Suction heating effects on the two-cycle are bound to be less than in the four, because the precompression cylinder is sure to be cooler than the working cylinder into which the four-cycle charge enters directly, and so also is clearance gas with which the fresh charge mixes, as in the two-cycle case; this is reexpanded fresh charge remaining after discharge, while in the four-cycle is hot burnt gases. All this two-cycle pump chamber charge will not enter the working cylinder nor remain there, for some will remain in the precompression chamber by reexpansion or failure of the pressure to drop during the open-port charging period to atmosphere. Some will escape through the exhaust port with the exhaust gases during the end of the transfer period when both transfer and exhaust are open, regardless of piston baffles or of special relative positions of inlet and exhaust ports designed for the purpose. During transfer the fresh charge bodily displaces the hot burnt gas that fills the motor cylinder and is clearance, and it is inconceivable that a considerable amount of mingling should not occur with corresponding heating and expansion effects. These mixture-heating effects are added to those of wall-contact heating, which walls in the two-cycle engines are always much hotter than in the four. The net effect is inevitably a discharge of some of the fresh charge with the burnt gases unless special arrangements are made to prevent this, and then each of these introduces its own evil.

Two methods of preventing this fresh charge heating on transfer in two-cycle engines and consequent loss of charge are in use, one is to intentionally reduce the charge transferred to so small a quantity as will not escape, and the other to expel burnt gases by a blast of fresh air, and then to expel this scavenging air which, of course, is cooler than the burnt gas, by the fresh charge. The former means intentionally reduced charge while the latter more than doubles the negative work of precompression which in effect is equivalent. Some part of the compression stroke in any two-cycle engine, so much as is required to cover the exhaust port, must result in further expulsion of charge. Naturally as in four-cycle engines, the charge weight can be built up in two-cycle engines to any value, by sufficient precompression, but to accomplish this the charge must continue to enter after the exhaust port is closed, which requires an admission or transfer valve mechanically operated and suitably timed, an extra complication. This is not common practice and no data are available on it, so for the present it must be regarded as merely an interesting possibility.

In the two-cycle engines the net effect of all heat exchanges and pressure changes, incident to charging the main cylinder, is undoubtedly a lower mean effective pressure and thermal efficiency than in four-cycle engines, and for equally good design and construction in each class the two-cycle is unable to carry compressions as high as the four, proving higher temperatures before compression. Any engine taking its charge into the crank case, as do most of the rotating cylinder four-cycle machines, or into a chamber connecting with the main piston, as the two-cycle Laviator, is subject to mixture quality impairment and equivalent charge loss, whenever the main piston leaks under its high explosion pressures, by the displacement of the fresh by the burnt gases.

While dealing with charge weights and volumetric efficiency of cylinders, the exhaust stroke of the four-cycle cylinder and the reexpansion stroke of the two-cycle precompression chamber must be considered as controlling by their terminal conditions of pressure the point of the return or suction stroke at which charging will actually begin. No flow can be started from the intake header until the cylinder pressure is lower. At the end of the four-cycle exhaust stroke the cylinder pressure is higher than atmosphere, and still higher than the mixture-header pressure by the amount of the suction header vacuum. Suction can not begin until the cylinder clearance volume of gases has expanded enough to lower the cylinder pressure (terminal exhaust value) to below that of the mixture header. An appreciable part of the suction stroke is therefore useless for actual charging, the loss increasing with higher terminal exhaust pressure and lower suction-header pressures. A similar condition exists in the two-cycle precomperssion chamber; for there the pressure at the time the transfer to the working cylinder is complete must be something higher than atmosphere, and the higher the speed the more excess there must be, because of the limited time for pressure equalization. This mixture must expand not only to atmosphere, but as much below as the suction header or carburetor vacuum,

even with a mechanically operated valve, and still more with the more common spring closed automatic check valve, by the amount of spring tension and valve inertia, before real suction can begin. The clearance in such precompression chambers is large, to limit the maximum precompression pressure to something less than 10 pounds per square inch, and, therefore, the reexpansion line will be very flat, cutting off a considerable part of the stroke as useless before the pressure has dropped sufficiently for suction to start. Many times the loss occurs here, as in four-cycle cylinders with their smaller clearances and steeper reexpansion lines, even with equal pressures at the start.

No separate data are obtainable for aero engines on any one of these quantities concerned with charge weight and the corresponding pressure and temperature changes, nor is there any indication that such information has even been sought. Even the over-all effects, as measured by volumetric efficiency, have apparently not been investi- [illegible] that is required is a measurement of air and gasoline or exhaust gas and a comparison with the piston displacement, the ratio of volumes constituting the true volumetric efficiency. Other things being equal, the horsepower per cubic foot of displacement per minute should be directly proportional to this volumetric efficiency, so it is a little surprising that the aero interests, which must have the most powerful engine per pound of metal, should have neglected to separately study each of the prime variables. As already noted, more designers seem to have been concerned with reduction of metal volume than with process perfection, though without proper execution of basic processes metal reduction may not only fail to give a light engine, but may even defeat the ultimate object by making the engine as structurally weak as it is weak in mean effective pressure or thermal efficiency. It must not be understood that no good performance results based on proper execution of the processes have been obtained; in fact, there are some most remarkable successes; but, on the other hand, these stand out so strongly as to prove that the procedure that has resulted so successfully is not the rule in the art, and may even in the case of the successful engine be as much a matter of good luck as patient, systematic investigation.

Assuming a good charge weight in the cylinder, or a high volumetric efficiency, the cylinder has at least the capacity for a high mean effective pressure and thermal efficiency, provided the subsequent treatment is proper. This treatment consists in compression with ignition before it is completed; combustion as rapid as possible consistent with absence of shocks; and expansion ending before the end of the stroke, by early opening of the four-cycle engine exhaust valve to drop the pressure to as near atmosphere as possible, at the end, and by uncovering the exhaust port of the two-cycle engine to get the same drop low enough before the end of stroke to allow the fresh charge to enter. It can be shown that both the mean effective pressure and the thermal efficiency will be highest for a given cylinder charge when the combustion starts as late as possible on the compression stroke and is completed as soon as possible on expansion stroke, or referring to the shape of the indicator card, when the explosive combustion line is practically vertical, leaning, if at all, toward the expansion line than oppositely. Such a condition of affairs results in the Otto gas cycle, the efficiency of which is a function of compression only and the mean effective pressure of which is a function, partly of the compression, but also partly of the height of the vertical explosion line, which in turn depends on the weight of the charge or the volumetric efficiency. Should the combustion line be not of this shape, results are bound to be inferior, as can be demonstrated thermodynamically, and yet the maintenance of such explosion lines in service operation so fundamentally related to results, is now as much a matter of hand adjustment as of design. This is a strong reason for caution in applying special test results obtained by skilled enginemen, to conclusions of aero engine possibilities in actual service, where engine skill is likely to be less than in the shop or laboratory and where, even if it were not, the problems of flight control are so absorbing as to minimize the attention that can be given to engine adjustment. Recognition of this condition also suggests the great desirability of exerting sufficient effort in design, to reduce to a minimum or eliminate entirely the dependence of the operating result on such adjustments as affect the shape and position of the combustion line. Such explosion lines as are desired and needed for maximum power and thermal efficiency will result, if the combustion period is confined to within a sufficiently small crank angle at the inner dead center when the piston is substantially at rest, and it is common to take this angle at about 30° half before and after dead center. At a rotative speed of 1,200 revolutions per minute about the minimum for the good aero engines, or 20 revolutions per second, each revolution is completed in 0.05 second, and an angle of 30° being one-twelfth of a revolution combustion will be completed in about 0.004 second. The higher speed engines of 2,400 revolutions per minute must accomplish the result in half the time or 0.002 second. In this short time the mixture must be ignited, and the flame communicated from particle to particle, till all the mixture has been burned, even the part most distant from the ignitor. Assuming a uniform linear rate of flame propagation or flame speed and a 6-inch diameter cylinder about as large a one as any aero engine carries, the flame must travel half a foot in 0.004 to 0.002 second, which requires a linear velocity of 500 to 1,000 feet per second, or 30,000 to 60,000 feet per minute if a single igniter is used on one side.

(To be continued)

HOUSING OF THE AEROPLANE ENGINE

Through the courtesy of *Flight* we are able to give in this issue the first of two sets of sketches showing some ingenious methods employed to house the engine.

The placing of the air-cooled engine in front where it receives the maximum benefit of the cooling rush through the air, but on the other hand offers the maximum amount of head resistance, has presented a serious problem to the constructor who wants to maintain all of the advantages of the first condition, and at the same time diminish as much as possible the disadvantages.

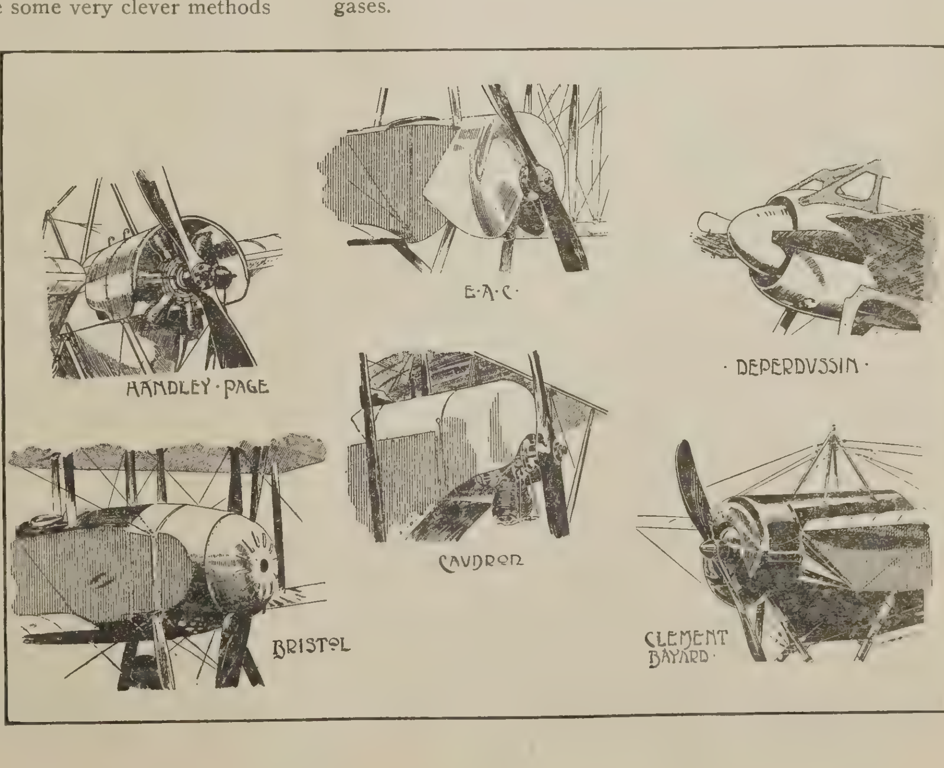
Obviously, a compromise is the best that could be expected. But in working out this compromise some very clever methods have been devised in the housing. In the Handley-Page monoplane, a strip of aluminum surrounds the upper half of the engine and is left open in front. This shield is reasonably effective in collecting the oil thrown out by the engine, but the nose of the fuselage and the crankcase are entirely exposed to the wind pressure.

In marked contrast to this is the cowl on the biplane built by the Eastbourne Aviation Co., which totally encloses the engine with the exception of the narrow opening at the bottom through which the cooling process is obtained.

Which of the two forms is the better considered from all the points involved is, of course, a matter of debate. When the Bristol scouting biplane was first introduced, it had a cowl enclosing the upper half, but in later models this was so altered that the engine was surrounded on all sides with the exception of a central portion around the propeller shaft which was left open.

This cowl is considerably larger than the body of the machine. It projects below the bottom of the fuselage, thus allowing the exhaust gases to escape. The curve of the cowl is gradually carried into the flat sides of the body. As the Bristol scout is a very speedy machine, any apparent disadvantages in this method of housing are seemingly set at naught by the speed records of the machine itself..

In the Clement-Bayard the engine is entirely covered by a main cowl, but air is admitted through an opening in front, which is again partly closed by a hemispherical nose piece. In the Deperdussin racing monoplane there is a very large nose piece revolving with the propeller and the engine is enclosed in a casing provided with holes for the escape of the exhaust gases.



FIRST STEPS IN STANDARDIZATION TAKEN

The first important step in standardizing in the field of aeronautics has been taken under the auspices of the War Department. The need of standardizing has been extensively discussed in the past three months at the meetings of the American Society of Aeronautic Engineers, and it was the efforts to start to carry out a substantial plan that led to finding that outside of the manufacturers of aeroplanes, the members of the standardizing committees would include many members of the automobile trade who have been active in the standardizing work of the Society of Automobile Engineers—and resulted in making the two organizations decide to combine efforts under one administration.

Data collected by Aviation Section of War Department, under direction of Captain V. E. Clark, valuable for standardizing work begun under the joint auspices of the American Society of Aeronautic Engineers, Society of Automobile Engineers, Army, Navy, Bureau of Standards and the Manufacturers

No	Name of Material	Act. Tens. Strength	Act Comp Strength	Mod of Elasticity	Remarks
1	Spruce, White	5560	8150	1,600,000	Tests Made
2	Ash.	8800	13084	2,170,000	at Bureau
3	Oak	9080	—		of Standards
4	Pine	6610	—		Washington,
5	Red Spruce	4880	13020		D. C.
6	Cedar.	5200			
7	Roebling Cable, 3/16	3500			These tests
8	" " 1/8	2300			have been
9	" " 7/64	1465			taken from
10	" " 3/32	800			Manufacturer's
11	" " 1/16	500			Report
12	Roebling Aviator wire, 10 Ga.	2000			
13	" " " 12 "	1300			
14	" " " 14 "	830			
15	" " " 16 "	540			
16	Bleriot Turnbuckles, 322	540			These loads
17	" " 323	830			are below
18	" " 324	1200			actual tests
19	" " 325	1300			and are used
20	" " 326	2000			for wires of
21	" " 327	3000			the tabulated
22	Bolts 3/16	1930	Shear 1575	30^6	stress
23	" 1/4	3440	2750	30^6	70,000 lbs. Sq. In
24	" 5/16	5370	4290	30^6	ult steel.
25	" 3/8	7730	6180	30^6	
26	Tubing	Very little	used		70,000# Sq. In.

	Description of Material Tested	Width of Material	Thickness or Diam.	Length in Inches	Elong. Length in In.	Yield Point Lbs.	Rupture Lbs.
1	COLD ROLLED SHEET STEEL.	1.000	.093	3.99	5.60	3000	4190
2	BESSEMER SHEET STEEL.	1.000	.039	4.00	4.75	1140	1880
3	COLD ROLLED SHEET STEEL.	1.000	.062	3.98	5.32	2160	2990
4	BESSEMER STEEL.	1.011	.035	4.00	5.10	1000	1650
5	COLD ROLLED STEEL.	1.015	.0925	4.035	5.53	3000	4480
6	COLD ROLLED STEEL.	1.011	.0605	4.01	5.456	2040	2840
7	COLD ROLLED STEEL.	1.012	.124	4.005	5.69	4040	5990
8	BESSEMER SHEET STEEL.	1.000	.063	3.99	5.21	1500	2735
9	COLD ROLLED STEEL.	1.000	.060	3.99	5.59	2600	2700
10	COLD ROLLED STEEL.	1.000	.046	4.00	5.48	1400	1980
11	GALVANIZED STEEL.	1.000	.027	4.01	4.70	800	1350
12	GALVANIZED STEEL.	1.000	.021	4.00	4.31	400	680
13	TINNED STEEL.	1.000	.024	4.00	4.81	700	958
14	BESSEMER STEEL.	1.000	.062	4.00	5.19	2000	2500
15	ROEBLING CABLE (1/8) 19 STRANDS.		1/8	23	23 5/8	2000	2130
16	ROEBLING CABLE (7/64) 19 STRANDS.		7/64	24	25 3/8	1450	1540
17	ROEBLING CABLE (3/32) 19 STRANDS.		3/32	23 1/4	24 3/8	1260	1300
18	ROEBLING FLEXIBLE CABLE. (1/8)		1/8	24	24 5/16	1170	1440
19	12 GA. PIANO WIRE.	.080	.080	27 3/4	28 7/16	1000	1100
20	14 GA. PIANO WIRE	.066	.065	27 1/2	28 7/16	740	895
21	NATIONAL TURNBUCKLE No. 327 BARREL	4 1/2"	NECK	.174,	THREAD	.232	2320
22	NATIONAL TURNBUCKLE No. 327 "	4 1/2"	"	.174	"	.232	3460
23	NATIONAL TURNBUCKLE No. 326		"	.158	"	.203	2700
24	NATIONAL TURNBUCKLE No. 326		"	.158	"	.203	2940
25	BURGESS MEDIUM—MEDIUM 3"		"	.176	"	.219	1920
26	BURGESS MEDIUM—MEDIUM 3"		"	.176	"	.219	2070
27	BURGESS SMALL SMALL 3"		"	.148	"	.189	1690
28	NATIONAL TURNBUCKLE No. 325 3"		"	.139	"	.183	2200

It will take several months to carry out the legal details of amalgamating the American Society of Aeronautic Engineers with the Society of Automobile Engineers, but the co-operation of the two organizations began immediately.

Howard E. Coffin, who is connected with both societies, and with the Naval Consulting Board, and has been most active in standardizing work, is at the head of this movement.

Henry Souther, the consulting engineer of the Signal Service at Large; and Captain V. E. Clark, technical expert of the aviation section of the Army, have been co-operating closely with the two societies. The technical authorities of the Aero Club of America also co-operate closely in this work. The club, as a whole, is responsible for getting the appropriations for army, navy and militia aeronautics, as well as arousing general interest in this subject

We told in the last number of AERIAL AGE of the aeronautic motor engineer's meeting at Bureau of Standards on July 18. The meeting was the initial meeting of this committee and was intended to develop the immediate needs for aeroplane motors and motor accessories in relation to possible standardization.

Standardizing Spark Plugs

The first accessory discussed was the spark plug. There has been some evidence produced by makers of ignition apparatus and by users of the same that a plug smaller in volume, in weight of metal, than the standard S. A. E., 18 gauge is advisable for aeroplanes. The evidence is that a 18 mm. plug is sufficiently lighter and smaller to radiate the excessive heat arising from aeroplane usage more perfectly.

This point was discussed in full, and investigations will be undertaken in the Bureau of Standards in the near future. The immediate needs will be taken care of by securing additional evidence from the users and makers of such spark plugs and the committee will report to the next meeting to be held about one month hence.

Standardizing Propeller Hubs

The next subject under consideration was the question of standard hubs for wooden propellers. Blueprints were produced showing the French standard as illustrated by Peugeot and by Hispano-Suiza. Testimony by Mr. H. M. Crane, of the Crane-Simplex Co., was to the effect that this represented the French standard for motors up to about 250 h. p. Action was taken, after considerable discussion, to the effect that the French standard would be adopted. This decision is not final and the matter will always be open to further discussion until the meeting of the Society of Automobile Engineers in January. At this time, if there is any objection, the discussion before final adoption will show it. Meanwhile, those designing new motors or building new motors will have their attention drawn to this hub standard and will be warranted in incorporating it in any new design because of the above action. Nothing better was shown by anyone.

It was the consensus of opinion of those present that all wooden propellers should be provided with the metal parts of the standard hub in the way of flanges, tube connection for the same and bolts—that these parts should not at any time be removed from the propeller for purposes of changing the propeller.

With the idea of taking a step in advance, it was suggested by Mr. Coffin that an attempt be made to render wooden propellers "quick detachable" in accordance with the practice of the Hub-Whitworth detachable wire wheel. This will probably be placed before the manufacturers of this wheel and a report made in connection with it.

In connection with this subject, the strength of propellers was discussed and much valuable information brought out by Mr. Sperry, of the Sperry Gyroscope Company. He set forth in a very clear manner the extraordinary forces exerted on the two-blade propeller by gyroscopic action.

Standardization of Gasoline Pipe Fittings

Investigation of the subject of standardization of gasoline pipe fittings, motor base width, and one or two other details was discussed and formal action taken to bring in the necessary blue prints, sketches and points of interest for the next meeting.

On the desk in the lecture room were exhibited parts of motors and motor accessories that had failed in actual service at Columbus. Those present, some twenty-seven in number, then gathered about the lecture desk and discussed the failures in detail. The example of good and bad soldering as related to

THE AUSPICES OF THE WAR DEPARTMENT

gasoline pipes; electrical apparatus that had developed defects; a propeller that had failed while in the air, an engine cylinder that was defective as to valve seat; broken specimens of wood, test having been made at the Bureau of Standards. There was much interest displayed in the parts which had failed in actual service. The meeting then adjourned to a store shed on the grounds of the Bureau of Standards to inspect a number of propellers that had been sent back from the Border for various defects, such as loose tips, improper driving of tacks so as to split propellers, examples of warping, and one badly broken propeller.

Climate Does Not Affect Glue

A valuable lesson learned was that in the case of the broken propeller, the lines of rupture showed no tendency to follow the glued joints between the lamina. It is therefore fairly conclusive that the effect of climate on the propeller is not as apparent on the glue as on the wood.

The engine which had been wrecked by a fall in the R-2 machine of Lieut. Chapman, near Columbus, and its radiator were closely examined. The uneven area of radiating surface about the hub of the propeller was particularly noteworthy. It was concluded that this contributed to the fluttering tendency of the propeller. It was brought out at this meeting that the radiator construction is now being avoided by the Curtiss Company.

At this meeting were present men representing the many kinds of engineering knowledge necessary for the final solution of the aeroplane motor problem. Among those who attended were: Henry Souther, Chairman; H. M. Crane, F. S. Duesenberg, A. F. Milbraith, Glenn L. Martin, A. Ludlow Clayden, Chairman, S. A. E. Standards Committee; Coker F. Clarkson, General Manager, S. A. E.; Director S. W. Stratton, Chairman Motive Power Sub-committee of National Advisory Committee for Aeronautics; Dr. H. C. Dickinson, R. P. Devries, B. L. Wormley, W. S. Lewis, T. J. Mosley, E. L. Lasier, Howard E. Coffin, Chairman Industrial Preparedness Committee of Naval Consulting Board; Elmer A. Sperry, Naval Consulting Board; M. B. Sellers, Naval Consulting Board; Captain V. E. Clark, United States Signal Office; Naval Constructor H. C. Richardson, Secretary National Advisory Committee for Aeronautics; Naval Constructor J. C. Hunsaker, Lieutenant W. G. Child, G. D. Wardrop, Editor, AERIAL AGE; Spencer Heath, R. R. Grant, W. D. Yenawine, Alan R. Hawley, President, Aero Club of America; Henry Woodhouse, Board of Governors, Aero Club of America, Director American Society Aeronautic Engineers. They met in this lecture room of the Bureau of Standards under the best possible conditions. The atmosphere of the room and its surroundings, the quietness of its location and the hearty welcome of Director Stratton, produced most excellent results. The discussion was open and free, and participated in by nearly every one present.

A vote of thanks was passed to Dr. Stratton for his hospitality and exceeding kindness in connection with the meeting.

Experiments Decided Upon to Meet Severe Flying Conditions at Mexican Border

A conference was held in the War Department on July 19, which should go a long way toward the ultimate cure of motor and propeller difficulties now experienced at Columbus.

There were present at this meeting every element that could possibly contribute to the knowledge and experience relating to the subject under discussion. The purely technical side of the question was represented by Director Stratton, of the Bureau of Standards, who is now co-operating daily with the Aviation Section. The Navy was represented by one of the Naval Constructors, the manufacturing world by Mr. Howard E. Coffin; the propeller manufacturers were represented, Mr. Glenn H. Curtiss, of the Curtiss Company, and Mr. Sperry, of the Sperry Gyroscope Company, were present, and officers of the Aviation Section, now in Washington, and Mr. Henry Souther, consulting engineer, represented the Army.

Under the able direction of Lieut.-Col. George O. Squier all red tape which formerly prevented standardization has been eliminated, and from now on standardization will go on as fast and as extensively as every consideration of efficiency will permit.

The discussion turned on the salient features—(a) the overheating of the VX motor in the intense heat at the Border, and (b) propeller difficulties.

After discussing every phase of the motor difficulty, under the severe conditions to be met in the Mexican campaign, it was decided to do two things—first, to decrease the compression of the VX motor by raising the cylinder with a suitable metallic gasket. The reduction of compression, which would follow, would decrease the horsepower from about 195 to 180. It is believed, however, that the reduction will not be noticeable, except possibly at extreme altitudes, because the motor will function better and produce better horsepower in the absence of abnormal heat due to high compression. The experiment will be tried on one motor, and

Data collected by Aviation Section of War Department, under direction of Captain V. E. Clark, valuable for standardizing work begun under the joint auspices of the American Society of Aeronautic Engineers, Society of Automobile Engineers, Army, Navy, Bureau of Standards and the Manufacturers

STRENGTH OF MATERIALS.

WEIGHT AND STRENGTH OF METAL.

	Weight per cubic inch	Elast. limit tens	Tensil strength	Ultimate compression	Shear	Mod. of elast
Steel cold rolled	.283	25000	50000	50000	40000	29,000000
Steel commercial mild carbon annealed		35000	55000			
Steel chrome nickel tempered		134000	150000			
Steel chrome nickel annealed		55000	80000			
Type D vanadium annealed		67000	100000			
Type D vanadium tempered		195000	210000			
Piano wire		280000	300000			30,000000
Aluminum	.096	10000	15000	12000	10000	11,000000
Duralumin	.103	29000	45000	50000	40000	
Tin	.265	3000	3500	6000	4000	4,000000
Brass	.310	20000	25000	30000	30000	9,000000
Manganese bronze	.319	50000	50000	80000	70000	14,000000
Copper	.320	12000	20000	80000	30000	16,000000
Monelmetal			80000			

WOODS.

	Weight per cubic ft.		Tension	Crush		
Ash (black)	50		14000	8600		2,000000
Cedar (white)	28		11000	48000		600000
Hickory.	48		13000	7000		
Mahogany	51		10000	8200		1,300000
Maple (rock)	46		10000	8000		1,900000
Oak (white)	52		10000	5200		1,800000
Spruce	32		11000	6000		1,825000
Walnut (black)	42		9000	5000		
Pine (white)			9500	4500		1,800000

WING SPAR CALCULATION.

$$\text{Max. } f = \frac{P\left(1+\varphi\frac{l^2}{K^2}\right)}{A} + \frac{wl^2y}{\lambda I}$$

k = radius of gyration about horizontal axis.
f = fiber stress, lbs. per sq. in.
P = total axial compressive load in pounds. (from stress diagram.
l = length of section or bay in inches.
A = area of cross section in sq. in.
w = transverse load per inch run in (lbs.)
y = distance from neutral axis to furthest fiber on compression side.
I = moment of inertia about neutral axis.

Both ends fixed in direction $\lambda = 24$ $\varphi \begin{cases} \text{for Spruce} = 1/6600 \\ \text{for Ash} = 1/4420 \end{cases}$

One end fixed , one pinned $\lambda = 15$ $\varphi \begin{cases} \text{for Spruce} = 1/3300 - 3800 \\ \text{for Ash} = 1/2210 \end{cases}$

Spruce. Ult. f = 10,500.
E = 1,750,000.

Ash. Ult. f = 17,000.
E = 1,900,000.

. . . .

The above formula is approximate only. In a more critical analysis of the stresses in a spar the procedure would be as follows :

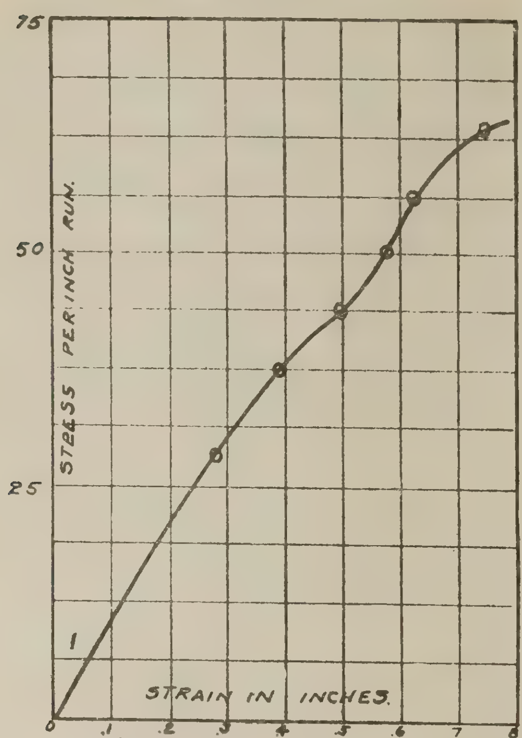
Calculate the maximum bending moment of the bay due to the wind lift, and the deflection of the spar at the same point. The product of this deflection and the total axial compressive load, gives an added bending moment which must be added to that due to the wind lift, giving the total bending moment (max.) in the spar. The stress in the outside fiber of the spar due to this bending moment can then be found by means of the formula, f = my/I. To this must be added the uniform compressive unit stress all over the cross section of the spar, which equals the total thrust divided by the area of cross section of the spar. The sum then gives the unit stress in the outside fiber of the spar.

The effect of drift load must be taken into consideration in determining the compressive stress in the rear spars.

This method gives correct results in the case of a beam fixed at both ends in which the maximum bending moment and maximum deflection occurs at the same point, i.e. the middle. In the case of a beam fixed at one end and hinged at the other, it is not true, since the maximum bending moment and the maximum deflection do not occur at the same poit. The error is small however.

The general method of finding the bending moments in a continuous beam is Clapeyron's theorem of THREE MOMENTS. For our purposes, however, it is sufficiently accurate to consider each section or bay of the spar separately. Where it is continuous over a point of support we will consi- that the beam is fixed in direction at that point.

DOPED FABRIC

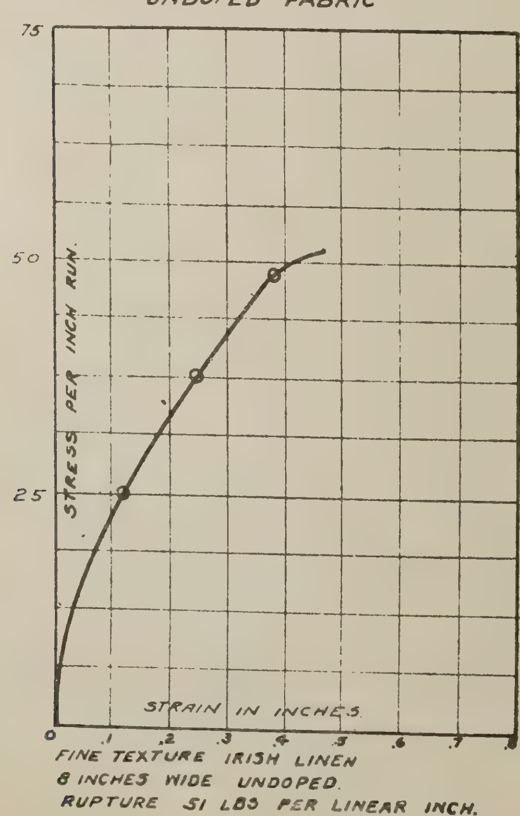


FINE TEXTURE IRISH LINEN
8½ IN. WIDE DOPED WITH 4 COATS.
OF EMAILLITE
RUPTURE 75 LBS PER LINEAR INCH.
18 INCHES LONG

the motor is being sent forward from the Curtiss Company. It was decided not to attempt this work at Columbus, because the push rods had to be of special length and some other slight modifications in necessary parts had to be made. The necessary material is at hand at the Curtiss factory. The idea is to send this modified motor to Columbus and return one of the spare motors in place of it.

The second procedure decided upon has to do with both

UNDOPED FABRIC



FINE TEXTURE IRISH LINEN
8 INCHES WIDE UNDOPED.
RUPTURE 51 LBS PER LINEAR INCH.

motor and propeller. It was decided to build one VX motor with a reducing gear to the propeller shift of the ratio of about 5 to 6. It was also decided that the maximum motor speed, in any event, should not exceed 1,500, and that the reduced speed should be in the neighborhood of 1,150 R. P. M.

It was believed that this expedient would materially reduce propeller breakage. This work will be undertaken at the Curtiss factory, and the promise of Mr. Curtiss is that his extensive force will work night and day and possibly make delivery in only about 30 days. That is, if there is no difficulty in getting aluminum castings.

Stress Upon Propeller by Gyroscopic Force

The discussion then turned on the subject of forces to which propellers are subjected, and the effect that the climate of Columbus and vicinity has on the propellers. At the meeting held at the Bureau of Standards the day previous, this question had been discussed at length, and at that meeting Mr. Sperry had brought out in a very startling manner the extraordinary stress put upon a propeller by gyroscopic forces. (We print an article in another section of this issue by Mr. Sperry on this subject.) It seems clear that there is a reversal of stress within the propeller as frequent as each one hundredth second and that these stresses amount to a bending moment of 2,750 pounds at a radius of one foot from the center. At the bolt circle this means something over 10,000 pounds.

The conclusion reached was that in all probability this stress is the cause of the violent flutter recently reported in the R-2 propellers.

Mr. Curtiss agreed to arrange a testing stand for propeller tests, which would constantly change the direction in the plane of rotation of the propeller, and thereby reproduce exactly the gyroscopic stresses above mentioned.

The discussion then turned upon the immediate relief of the wooden propeller situation, and it was agreed that infinite care should be used in the protection of the wooden propeller from all temperature and moisture or humidity influences. In brief, it was decided wise to protect the propellers during shipment by metal lined boxes carefully sealed by felt washers, to carry all stock propellers in such boxes by daily care, introducing moisture if necessary by some practical expedient, such as a metal container or bottle with a wick.

While the propellers are attached to the machine they should be at all times protected by a heavy canvas jacket lined with some canton flannel or wool, possibly like a blanket.

In the field, in case of landing at a distance from the camp, the propeller should be protected by a woolen stocking saturated with oil drawn over the blades and the hub as far as possible.

The ultimate propeller was then discussed, and it was decided to promote, in every possible way, the development of a metal propeller which should be free from all troubles due to atmosphere or temperature changes. To hasten this development an engineer has been employed, whose sole duty will be to co-operate with all manufacturers attempting to produce a metal propeller. There are already three or four such developments started.

In conclusion, it does seem that success should follow the bringing together and obtaining the co-operation of every possible element of knowledge available. The temporary expedients recommended in connection with the motor and propeller should ameliorate the present condition. The ultimate development will follow as rapidly as possible.

War Department Has Done Valuable Work Collecting Scientific Data for Standardizing

Under the direction of Captain V. E. Clark, the Aviation Section of the Army has done valuable work in collecting scientific data for use by the inspectors who are assigned to aeroplane factories to inspect the construction of army aeroplanes, and to supply to aeroplane manufacturers.

The most important of this data which the War Department has collected is reproduced herewith—to help the work of standardizing.

SPACING OF STRUTS ALONG SPARS.

The distance between the struts along the spars should be so chosen as to make the bending moments at the strut joints the same. Equating the bending moments gives : $wL_1^2/2 = wL_2^2/12 = wL_3^2/8$, where w = the load per running inch, L the length of the bay in inches. The first term is for the cantilever overhang, the second term for the outside pannel, which is a beam fixed at both ends and uniformly loaded, the third term is for the bay next the engine section, which is a uniformly loaded beam fixed at its outer end and pinned at the other.

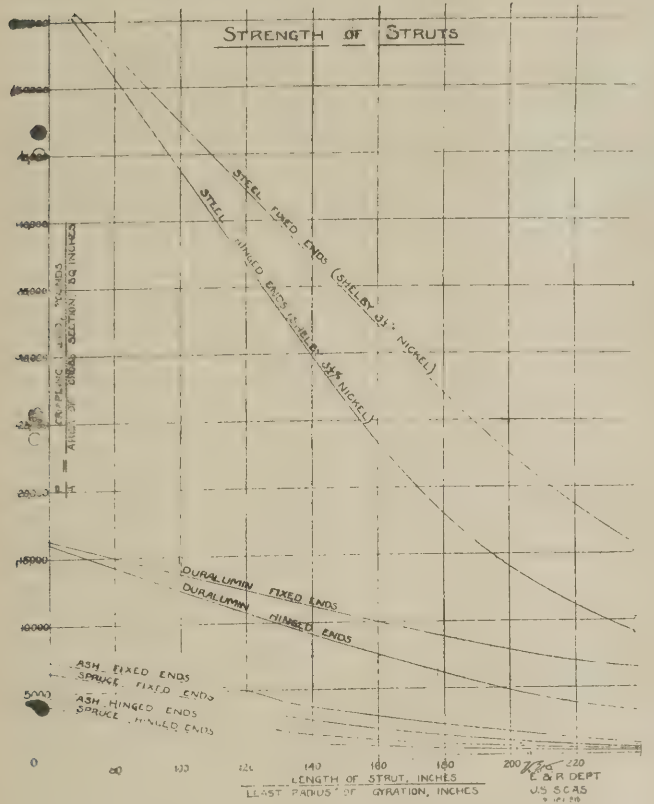
The sum of the pannel lengths equals the span length, which gives another equation: $L_1 + L_2 + L_3 = L$

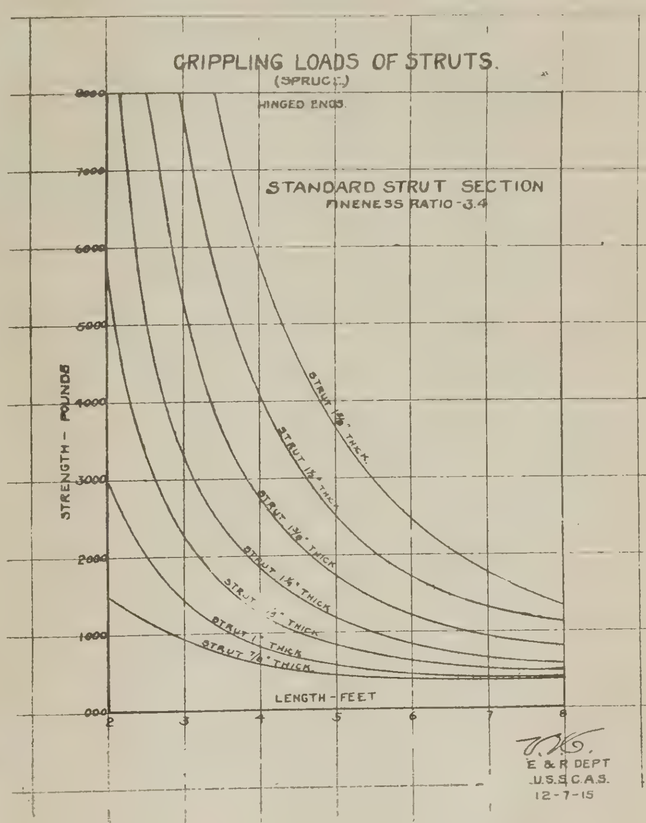
Solving these three equations gives for the values of

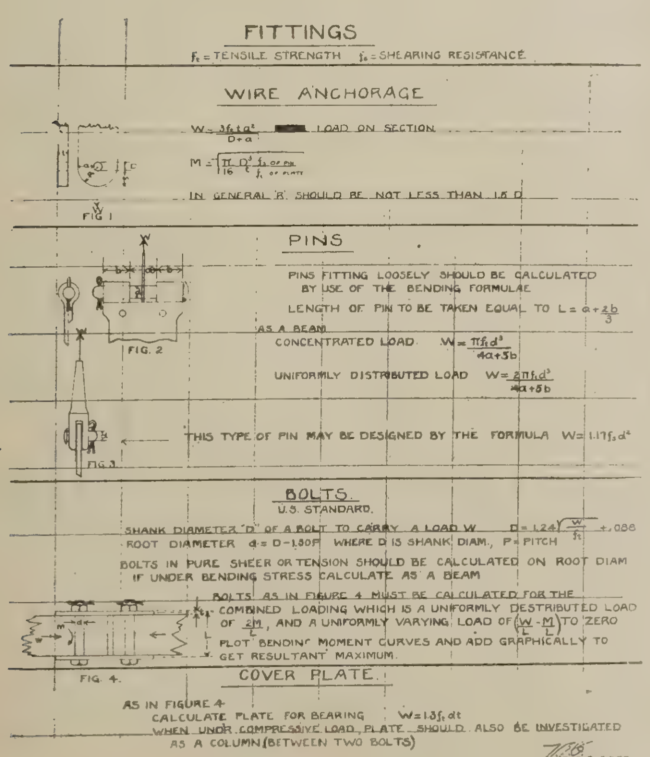
$L_1 = .183\ L$
$L_2 = .450\ L$
$L_3 = .367\ L$

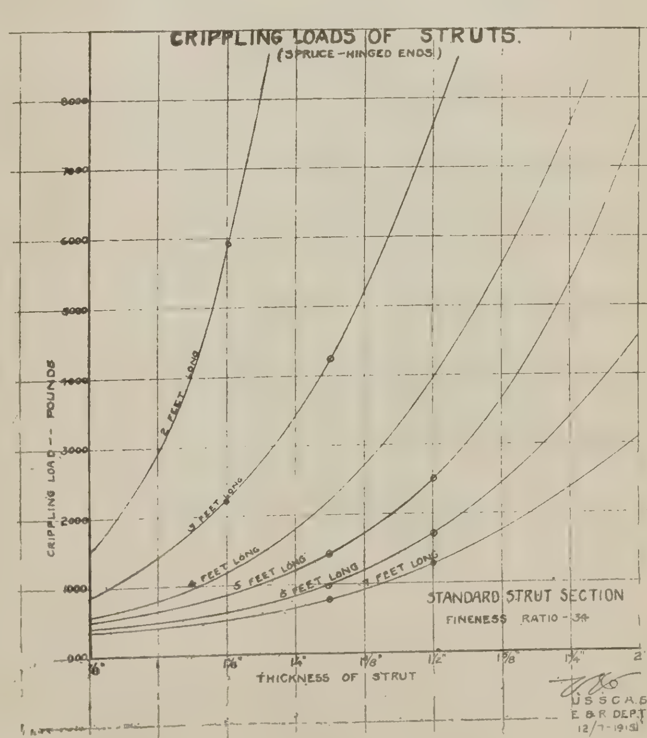
These values are again but approximations since it is assumed in the solution that the running load is uniform from center to tip of the wing, which is not the case, the loading being effected by the propeller stream, wash-out, slip over the tips of the wing, etc.

Data collected by Aviation Section of War Department, under direction of Captain V. E. Clark, valuable for standardizing work begun under joint auspices of American Society of Aeronautic Engineers, Society of Automobile Engineers, Army, Navy, Bureau of Standards and Manufacturers









MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
6730 Ridge Boulevard, Bay Ridge, Brooklyn

YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
47 Churchill St., Springfield, Mass.

MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Model Builder Wins Scholarship

From flying models to flying large machines is a natural step; from designing models to designing large aeroplanes is a logical sequence also, but the latter instance is rare because of the fact that few model builders *design* their models. Most models are built from fuselage to wings, from wings to propellers and from propellers to rubber strands.

Mr. Ellis Cook, of Chicago, is one of those who designs his models and who knows almost exactly what duration, speed and number of strands each model takes before the first stroke of work is done. Building models this way doubles the pleasure of educational value of the work. It also does away with the "fitting" of parts to parts until the right assembly is determined by lengthy experimentation.

The exceeding pleasure of model design and the promising future of the consulting aeronautical engineering business led Mr. Cook to work for an engineering scholarship in the Armour Institute of Technology. He won the scholarship and will take up the more intricate problems of aeronautical design.

Ellis Cook
Member, Illinois Model Aero Club

The Aero Science Club of America

Under date of July 30, Mr. John McMahon tested out his new compressed air-driven monoplane at Highland Park, L. I. With the use of a rudder the model would in all probability have broken the American distance record for this type of model. As it was, the model made four circles with a duration of eleven seconds. The model will be given a second test in the very near future, at which time an attempt will be made to break the American distance record.

Buffalo Aero Science Club

June 30, 1916, was the first anniversary of the organization of the B. A. S. C. On July 1, the Saturday following, the club's duration record of 70 seconds was raised to 138 2/5 seconds by a reproduction of the Lauder model, made by J. William Schreier.

On the evening of July 13, Christian Weyand, Leon Schreier and J. William Schreier gave a demonstration of flying models to the Curtiss Club, at their rooms in the Engineers' Hall Building. M. Weyand read a paper on the use of constructing flying models and a comparison of them with scale models. In return the Curtiss Club has invited the B. A. S. C. to fly models at the Aviation School grounds on the Falls Boulevard. The invitation was gladly accepted.

Mr. Carter Tiffany, a member of the Aero Science Club of America, was present at the meeting of July 18. He related the interesting experiences he has had with both gliders and models, working with Mr. Lauder and other model builders. Mr. Tiffany is taking the course in flying at the Curtiss School here. At the meeting, Mr. Weyand explained the balance of a biplane glider in flight, using suspended cardboard models.

A field meet was held Saturday afternoon, July 22, and fine weather prevailed. Mr. Schreier's Lauder model made a distance of 2,145 feet, which establishes a new club record, the former being 1,625 feet, made by Mr. Schreier's Schultz model. Mr. Weyand flew a fast double pusher R. O. G. model, which could be regulated to fly normally or to raise to a considerable altitude and perform several complete loops, but unluckily the model was wrecked in an attempt to make it prescribe larger loops. Mr. Weyand also tried out an efficient single pusher of original design which he will develop further as a duration model. Several other models were successfully flown, including one of the Dunne principle of stability built by Clarence Gellart.

Address communications to J. W. Schreier, Secretary, 48 Dodge St.

The Lucas Glider

The glider shown in the accompanying photograph was designed and constructed by Mr. Stockwell S. Lucas, formerly President of the Poughkeepsie Model Aero Club. Mr. Lucas also holds the model aeroplane record of that club.

Many successful glides were made by Mr. Lucas, the longest of which was seven hundred and twenty-five feet with an altitude of approximately seventy-five feet.

The glider is of the standard biplane type with a wing spread of twenty feet. The wings are covered with aeroplane linen and coated with spar varnish. Silver spruce is used throughout and the manner of bracing is the same as that used in large machines. The weight of the glider complete is 42 lbs.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Farm Tractor

Observer: "The enemy below are as thick as peas. What shall I do?"

Pilot: "Shell them, you fool, shell them!"

A Self Starter

Aviation Squad Commander: "Now boys, go up in your machines and fight like fury until your gasoline gives out; then come down and run for your life. As I am a little lame I will start now."

For How Long?

Assistant—"How much is a guinea worth?"

Manager—"About a dollar and a half a day."

Among the Clouds

"Tom, stop that!"

"Why?"

"If you can't drive with two hands, let me take the wheel."

"Do you drink?" said the exhibition manager to inquirer.

"That's my business."

"Have you any other business?"

Illuminating Thought

First Mechanic—"I wish I was built like a lamp post."

Second Mechanic—"For why?"

First Mechanic—"So I could lean against a cop when I was lit."

"IT'S YOUR MOVE, BILL"

A la Blackstone

"I understand that Bligly the aeronaut downed you in an argument."

"Yes—but I have sued him for trespass."

"For trespass?"

"Yes—he walked all over my premises."

Outside the Hangar

"Hello, Bill, where'd you get the dog?"

"What's the matter with that dog? Don't you like him?"

"No, his legs are too short."

"Well, they reach the ground, don't they?"

Wilson—"Did you hear about young Cadish?"

Pilson—"No! What about him?"

Wilson—"He had his brains blown out while fiying over the trenches in France!"

Pilson—"Gee! He must have been hit by a crack shot!"

"What scenes do you like best in the movies?" said the flyman to his friend.

"The windy ones."

The Surest Way

The workman was busily employed leveling the ground near the entrance to the field, and the wayfarer paused to inquire. "What are you digging for?" The workman looked up.

"Money," he replied.

"Money! And when do you expect to strike it, my good man?"

"On Saturday!" replied the other, and resumed operations.

Behind the Trenches

Pilot—"That guy would certainly make a good soldier."

Mechanic—"Howssat?"

Pilot—"O, you can treat him but he won't retreat."

Reflections

"Have you seen Jones, the pilot, since he got married?"

"Yes, and I asked him if all the jokes about married life were so."

"What did he say?"

"He said some people had strange ideas of what constitutes a joke."

Quantity, Not Quality

Mechanic—"I want a Webster's largest size dictionary."

Librarian—"We have none in now except the small ones."

Mechanic—"Naw, this is important; there's a leg missing on my dresser."

"What is all this V. C. the English aviators are getting?"

"Why, don't you know? It's Very Common."

An exhibition flyer, while in Omaha, was looking at some of the modern sky-scrapers. "Land sakes," he snickered, "there's some of them continued stories I've heard so much about."

Aero—What's the matter with your eye?

Naut—Bill planted a blow there and it grew up and blossomed.

After the Flight

"And believe me, she's some girl."

"Clever?"

"Oh, very! She's got brains enough for two."

"Just the girl for you. Why don't you marry her?"

"Ever have any money left you?"

"Yes, and it left me quick."

AERIAL AGE WEEKLY

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VOL. III NEW YORK, AUGUST 14, 1916 No. 22

Congress Allows $17,000,000 for Army and Navy Aeronautics—Aero Club of America to be Congratulated

AT last it may be said that the United States has taken up aviation. The Senate increase, for military aeronautics, which must not exceed the sum of $13,281,666, has been accepted by the House conferees, Messrs. Hay, Dent and Kahn, minus only $200,000. The Senate's proviso for $200,000 for the purchase of College Park for aviation purposes is modified to a stipulation that a committee of Army officers shall be designated to look over the country for a suitable site for aviation, and making available for such a site when chosen the sum of $200,000.

Both Houses have approved the appropriation of $3,500,000 for aeronautics for the Navy—bringing the total for aeronautics for 1917 up to close to $17,000,000, there being several other miscellaneous appropriations for aeronautics besides the above mentioned.

The Aero Club of America is to be congratulated for this achievement—for it was the Club that directed the work to get these appropriations. As we look back to the columns of accounts of the various phases of the Club's campaign which we printed in AERIAL AGE we can but marvel at the volume of work done and the value of the national services rendered. We consider it a rare privilege to have assisted in carrying this campaign to a successful completion—and we fully believe that the other important campaigns, such as the developing of Pan-American aeronautics, introducing aeronautics in universities, applying aircraft for utilitarian purposes and others will equally be attended by full success.

Wright Company, New York, and Glenn L. Martin Company, Los Angeles, Merge

ANNOUNCEMENT is made of the merger of The Wright Company and the Glenn L. Martin Company, of Los Angeles. This new consolidation will be known as the Wright-Martin Aircraft Corporation, incorporated under the laws of the State of New York, with $5,000,000 7 per cent. cumulative convertible preferred stock and 500,000 shares of common stock with no par value. Edward M. Hagar, president of The Wright Company, will be president of the new concern; Glenn L. Martin and C. S. Jennison will be vice-presidents. The official statement follows:

Under the arrangement there is acquired the organization headed by Glenn L. Martin, which has in active operation a Los Angeles plant turning out ten aeroplanes a month. Mr. Martin devotes his entire time to the aeroplane department of the new company. The Wright-Martin company takes over The Wright Company which now owns all the Wright patents, the Simplex Automobile Company and its plant, the stock of the Wright Flying Field, Inc., and that of the General Aeronautic Company of America, Inc., which handles the foreign business of The Wright Company.

The Martin plant at Los Angeles will continue to be operated and a large factory will be erected in the East in the vicinity of New York. The factory of The Wright Company at Dayton will continue its experimental work. The Simplex plant at New Brunswick has been recently enlarged and new buildings are still in course of erection. They have been filled with the finest machinery produced by modern designers, and the plant is the most complete and up-to-date of any in the world. Twenty-two hundred men are at present employed on the new aviation engine and on Simplex cars, which represent the ultimate in motor car construction. A complete technical laboratory has been operating at New Brunswick for some months where elaborate tests are conducted on steels and other metals entering into construction of the aero and automobile engines and with respect to all other conditions of the manufacture of a perfect motor. The Wright Flying Field is at Mineola, L. I., where 665 acres of the Hempstead Plains are under lease. The Plains are known all over the world as one of the great aviation fields, ranking with Pau and Rheims and the other principal aero centers of Europe. They extend eastward for many miles and nearly the whole of Long Island may be flown over—an area of 1,300 square miles.

The United States Government now occupies fifteen of the twenty aeroplane sheds at the Wright Flying Field for training of aviators and the testing of machines for Army use.

In view of the demand for a high class reliable aeronautic motor it was necessary that The Wright Company manufacture its own, and to this end it acquired control, some months ago, of the Simplex Automobile Company, long builders of the highest grade automobiles in this country, embodying a standard of work comparable only with the work necessary in a modern aeronautic motor. It is absolutely essential that such a plant have its own facilities and expensive special machinery to produce the proper quality for a modern motor of the highest type. The company has gone even to the extent of erecting its own foundries for the making of patterns and the casting of iron, aluminum and brass. The capacity of the new plant will be over a million dollars a month.

As a part of its plans, The Wright Company secured last year the exclusive right to manufacture the Hispano-Suiza aero motor in this country. There is to-day no such motor produced in this country equal to the development of aero motors in Europe. The Hispano-Suiza is recognized as the best of foreign types, the French Government having placed orders for as many as 1,800 of these at one time. This engine is much lighter per horsepower and has given better results under test and at the front than any other. It weighs but 363 pounds and develops 150 horsepower. Deliveries are about to begin on one order of 450 of these motors from the New Brunswick factory for the French and Russian Governments. The operation of the first motor was unusually satisfactory, and the rights for this motor and the possession of the only large and well-equipped factory capable of producing an engine of this character, give the new company a commanding position in the world of aeronautics.

The Wright Company was originally organized in 1909 by Wilbur and Orville Wright, the discoverers of human flight and the first to produce a power-driven aeroplane, six years after their first successful experiments, with a capital stock of $1,000,000.

In 1915 the company was sold to a syndicate headed by William B. Thompson, Harry Payne Whitney, T. Frank Manville and others. The Simplex Automobile Company was also purchased and the capital stock was then increased to $5,000,000. Orville Wright was retained and now continues in a consulting capacity.

In March, 1916, Edward M. Hagar, formerly president of the Universal Portland Cement Company, of Chicago, a subsidiary of the U. S. Steel Corporation, was elected as president of The Wright Company.

The present directors of The Wright Company consist of the following: F. W. Allen, Fred W. Adams, Henry M. Crane, T. L. Chadbourne, Jr., Harvey D. Gibson, David M. Goodrich, Edward M. Hagar, C. S. Jennison, Henry Lockhart, Jr., T. Frank Manville, S F. Pryor, Henry R. Sutphen and Harry Payne Whitney. Among the principal stockholders of The Wright Company are William B. Thompson, A. H. Wiggin, William E. Corey, Percy A. Rockefeller, Ambrose Monell, E. C. Converse, C. H. Sabin, John D. Ryan and Henry R. Carse.

Glenn L Martin is one of the pioneers of aviation in America. He began in 1909 experimenting with aeroplanes and taught himself to fly as have so many of the famous flyers of earlier history. In 1910 he was a constructor, and

through sheer merit, handicapped bq lack of proper financial resources, forced his reputation to the top notch, until at the present time his company is a principal source for aeroplanes for the Army. He has a record of having manufactured a comparatively large number of aeroplanes of various types for the United States Government without a single serious accident to pilot or passenger in any of these machines, although the total hours spent in the air by officers of the Signal Corps in Martin machines is greater than that of all other makes combined.

Orders now on hand by the Martin Company are for the U. S. Government, Holland and Netherlands East Indian Government. Three types are being produced—a light two-man reconnaissance tractor, adopted for training work in the Signal Corps; a fast two-place tractor carrying a useful load of 960 pounds, with a speed range of 46-86 miles an hour, fuel capacity for six hours and a climbing ability of 3,400 feet in ten minutes; and a two-place tractor seaplane, used in the Philippines and the Coast Patrol.

It is now obvious that the greatest *sporting* vehicle is to come into its own. Some of the greatest business men in the world are entering the field of aviation on the industrial side.

As to accomplishments it may be interesting to note that already aeroplanes have developed to a stage where they are carrying useful loads up to three tons at eighty miles an hour with fuel capacity for sixteen hours at a time, covering a distance of over 1,200 miles without landing.

Col. Glassford Lauds North Island as Aviation Site

JULY 27 was "Aviation Day" for the Chamber of Commerce of San Diego, and a large delegation of its members, argumented by a hundred officials and employees of the Santa Fe coast lines, were the guests of Col. W. A. Glassford, U. S. A., in command of the aviation school and camp on North Island, during a tour of the plant in the morning.

Practically the entire party attended the weekly luncheon of the Chamber of Commerce members' council at the San Diego Hotel grill, where Col. Glassford explained in more amplified form his well known preference for North Island as the best site in the United States for what he termed the "aviation university."

Col. Glassford's guests were taken across the bay in the Star & Crescent Boat Company's sea-going tug Virginia and a smaller boat, and at the aviation dock were divided into smaller parties which were taken over the field and the various departments under the charge of officers of the signal corps. These included Captains Lahm, Culver, Royden, Reynold, and Lieutenants Von Holtzendorff, Farron, Lovell, Butts, Davidson, Heffernan, Russell, Barnitz, Harmon, Bartholf, Cunningham and McIlvaine, the latter two of the marine corps.

The various types of flying machines were described by the officers and one of the more interesting, because newer, phases of military aviation was shown by Capt. C. C. Culver. This was a biplane equipped with a radio outfit, and Capt. Culver explained its use in reconnaissance and in spotting artillery fire.

During the visit, flying machines rose from the ground and soared off into the blue, while others circled closer overhead and still others were brought to land, close to the spectators, so that the manipulation of an aeroplane, in all but the more spectacular phases, practically was demonstrated before many eyes for the first time. The visiting Santa Fe officials from interior towns especially were interested in the demonstration.

George G. Prentice, who recently became a permanent resident of San Diego, and has seen aviation camps in all parts of the world, said that nowhere else, except in Egypt, where the heat at times is intolerable, had he seen a place so perfectly adapted to the use of aviation as North Island.

After a leisurely inspection of grounds and buildings, carried out with military precision, the party returned to the San Diego side and to luncheon of the Chamber of Commerce, where Col. Glassford spoke on, "North Island, the Greatest Aviation Site in the United States."

His remarks were so frequently punctuated with applause that there was no room for doubt as to his hearers being in thorough accord with him. He quoted at length from the findings of the commission created by Congress.

Col. Glassford said in part:

"Southwest California is the one and only area of the United States over which no cyclonic storms, no tornadoes nor cold waves sweep. This fact several years ago brought one of the world's greatest demonstrations of aviation to Dominguez field near Los Angeles.

"People from all parts of the world gathered at Dominguez field and were astounded at what they saw, and the world heard with equal amazement of the winged feats that took place there. The success at Dominguez field attracted the attention of Christendom to Southern California as the one place where flights could be made with continuous certainty and safety. The Curtiss aviation people discovered at North Island a better place, because conditions permitted safe flying every day in the year. The searching and weather eye of Uncle Sam was not long in likewise discovering where he, too, could with safety and at all seasons of the year train his fledglings to brave the navigation of the air. Congress recognizing aircraft had become an engine of war and realizing the need of a training school, created a commission under the war department to examine the Atlantic, Gulf and Pacific coasts with a view to selecting a site at which to locate an aviation school.

"The commission found no place suitable outside of Southwest California, and 'the terrain in the vicinity of San Diego bay fulfills the necessary conditions better than any other section of the United States.' North Island was by this commission described as 'The best possible site for the location of an aviation school.' Nearly a year ago, when the commission examined North Island, the president of the owning company announced that 'He would not consider an offer for the sale of North Island.' Notwithstanding, the commission, in its determination to acquire the best possible site, raised the question of title to North Island, and caused the title records be investigated and were apparently so confident that it might be retaken for public defense that they recommended that if 'it is finally ascertained that the United States has a title to North Island, the signal corps aviation school be located thereon.' After investigation, however, the further questioning of the validity of the title was abandoned. It will be seen therefore that North Island is only temporarily occupied, and at the will of the owner.

"Several months ago I was instructed by the war department to search for a suitable location to which to move the aviation school from North Island. Every suggested and possible site in California from San Pablo bay near San Francisco on the north, to the Mexican boundary on the south, was examined and North Island was found the only site that combined all the desired conditions.

Owner Extends Permit

"The owner in the meantime, in consideration of the fact that North Island was so needed to facilitate the creation of our aero defense, consented to let the government continue occupancy with a view of its purchase if desired, at a fair price. Every one at all familiar with property values in Southern California knows that this means millions of dollars.

"It is a conspicuous fact that we have been trained in the school of scrimping, when it comes to government expenditures, and cannot in a moment appreciate such money magnitudes; this is the case when applied to a government property pudchase in the southwest cornore of the United States.

"In face of the magnitude of current military operations in Europe, the prudence of preparedness has been accepted by the people and the price of adequate aerial preparation has been shown to be no catchpenny proposition. Six months ago the people would not permit nor would the government authorities tolerate the thought of unlimited expense even in national defense. The increasing consideration being given to aviation, for instance, is illustrated by what has been done in the past and is now proposed for it in the future:

Appropriations Increased

"In 1908-9 the first tests of the military aeroplane were made at Ft. Myer, Va. In 1911 was the first appropriation of $125,-000. In 1914 the aviation appropriation was increased to $250,000, and the aviation section of the signal corps created. In 1915 the appropriation was increased by $50,000, or $300,000.

"The behindedness of this country in the provision of military aircraft is illustrated by the number of aeroplanes some of the European countries had at the commencement of the war in August, 1914: France had 1,400; Germany, 500; Great Britain, 400. Today there are about 20,000 military aeroplanes. At the opening of the present session of Congress, the following figures will illustrate the situation:

"The sum of $1,222,100 was submitted by the war department as adequate for aviation, and $2,000,000 was added to this on June 21; $13,281,666 was the amount of the revised estimate submitted by the Secretary of War to Congress about July 1, and so evident was the necessity that the Senate has increased even this figure; $28,975,000 was the suggested amount *proposed by the Aero Club of America* that brought about this revolution of the estimates by the war department on July 1.

Purchase Inevitable

"Can there be any doubt that when so large an appropriation for aero defense is passed, appropriate provision will be made for a base upon which to place the necessary installations to train a great number of army, national guard and civilian aviators. The necessity will be so plain that Congress can no longer hesitate to authorize the acquiring of North Island."

THE NEWS OF THE WEEK

First Aerial Coast Patrol Unit Advance Rapidly—Three Types of Seaplanes at Port Washington

Messrs. Alan R. Hawley, president of the Aero Club of America; Henry Woodhouse, governor of the Aero Club of America; Major Carl F. Hartmann, in charge of aviation in the department of the East, paid a visit to the aviation center which is very rapidly being organized at Port Washington, L. I. The first unit of the Aerial Coast Patrol has established its headquarters there, and the ten members are flying daily, Mr. David H. McCulloch being the instructor. The Trans-Oceanic Co. of America is building a large hangar for its flying boat which is also being used daily for instructing the members of the Aerial Coast Patrol. . . . . .

About one hundred yards away from the hangar of the Aerial Coast Patrol is Harry Payne Whitney's hangar in which is housed the Burgess-Dunne aeroplane. Nearby there is being built a hangar for Caleb Bragg, who is to have a Martin model seaplane.

Messrs. Alan R. Hawley, Henry Woodhouse and Major Hartman made flights with Mr. McCulloch. Mr. Hawley was taken for a long trip across the Sound to the Larchmont Yatch Club. On Mr. Woodhouse's flight, experiments were made to see just how easy it would be to hunt aquatic birds. The birds experimented upon were sea-gulls, which were, of course, not shot, but which were easily passed in their flight by the flying boat, and out-manœuvred in every way, so that apparently the sea-gulls could not have escaped had the flyers been really hunting. During this flight, the flyers also saw the fins of a shark which was evidently swimming around the bathing places looking for food. It was Major Hartman's first flight, and he expressed himself as marveling at what an observer could see from aircraft.

The members of the Aerial Coast Patrol Unit are enthusiastic over the flying, and are advancing very rapidly in their course of training.

Charles Reid, of Governor's Island, Passes Military Test

Charles Reid, one of the members of the Governor's Island Aviation Unit, has passed his test for the Junior Military License, being the first civilian who officially tried for this test.

For the past three months flights have been made daily, and at present there are three Curtiss J. N. tractors and a Sturtevant 100 horsepower battle-plane. Charles Reid, who took his pilot's license at the Wright School, Georgia, last winter, is now a star flyer, so much so, that he very easily passed the test for the Junior Military certificate, flying from Governor's Island to Garden City, and making other cross country flights of importance, and other demonstrations of thorough experience.

Coast Guard to Have Aerial Stations

The amendment providing for the use of aeroplanes in the Coast Guard went through the Senate and is now in conference, with a good chance of being accepted by the House conferees. It is authorized by the bill now going through to make mutual arrangements with both the Army and Navy for the training of their aviators. At this time the Coast Guard has two officers under aviation training at the naval base at Pensacola.

This Coast Guard provision, which is part of the naval bill, as reported by the Senate Committee on Naval Affairs, provides for the establishment, equipment and maintenance of not to exceed ten aviation stations at points on the Atlantic Coast, Pacific Coast, Gulf of Mexico, and the Great Lakes to be selected by the Secretary of the Treasury. At one station a school must be established, and one skilled instructor is to be employed at $4,000 and an assistant at $3,000 per annum.

Carlstrom Flies for President Wilson

On July 30, Victor Carlstrom piloted a twin-motored JN-4 hydroaeroplane through manœuvres lasting nearly an hour, flying around and making landings near the President's yacht "Mayflower," which had President Wilson on board, and the cruiser "North Carolina," as they lay at anchor off Old Point Comfort, Va. The machine carried as passenger and observer, Lieut. Maxfield, of the Navy Flying Corps, who is attached to the "North Carolina" in her aeronautical duties. It was on this vessel that the first successful catapult was constructed for the launching of 'planes from the ship's deck. A Curtiss model "E" hydroaeroplane was used to demonstrate the possibilities of such work, which is now, of course, frequently done in several of the world's navies.

* * *

Altitude records for Buffalo territory were made last week. Instructor Lieut. Phil Rader, accompanied by B. O. Jenkins as observer, climbed 10,100 feet in 50 minutes, using a 90 H. P. school "JN-4." Pilot Victor Carlstrom, with a 160 H. P. "R" machine, ascended 14,000 feet a day or two later.

* * *

Hereafter only Curtiss propellers, with which proper performances can be guaranteed, will be furnished with the model "VX" 160 H. P. motors.

New Officers for L-W-F Engineering Co.

As we announced last week, Robert G. Fowler and Charles F. Willard are no longer directors or officers, nor connected with the L-W-F Engineering Company, the control having been taken over by Joseph Osler, president of the Fifth Avenue Bond & Mortgage Company.

Mr. Osler will be president of the company; Mr. Albert H. Flint, vice-president and general manager, and Mr. M. J. Murray, secretary and treasurer.

Mr. L. D. Tompkins, Mr. Edward Lowe, Jr., and the above officers compose the board of directors.

A group of Harvard students at the Thomas School at Ithaca. Standing: William Meeker, A. L. Richmond; sitting: Kenneth Merrick, Robert Mendell 2nd, and Herbert Pulitzer

Messrs. Hawley and Woodhouse Inspect Fire from Air

Messrs. Alan R. Hawley, President of the Aero Club of America, and Henry Woodhouse, of the Board of Governors of the Aero Club of America, on August 1, flew over to inspect the scene of the fire on Black Tom Island from the air. Mr. Charles Reed, one of a dozen candidates for the Aerial Reserve Corps, who are getting their aviation training at Governor's Island in the four machines acquired for that purpose by two prominent sportsmen, interested in developing our aerial defenses, was the pilot who took Mr. Woodhouse first to the scene of the explosion and fire on Black Tom Island, in a 100 h.p. Curtiss military biplane. From a height of 4,200 feet these gentlemen could only see the smoke of the smouldering ruins—so small as to appear insignificant to the eye. From a height of 2,000 feet they could see the wreckage of the explosion and fire very plainly in every detail.

It was Mr. Woodhouse's fiftieth flight and the second flight that Mr. Hawley has made since he flew from New York to Washington. Being interested in national defense and being anxious to find just how exposed New York City is to aerial attack, they went over the East and Hudson Rivers overlooking the city, which lay down below them an open target with every building plainly visible and every boat standing out against the background of dark water, the city and the ships all making clear targets. Mr. Hawley's conclusion, after seeing the city from the air, was that an aerial bomb could not miss hitting a vital part—and that if there should be war the enemy airmen would find New York a clear and open target. At present the only aeroplanes available are the four aeroplanes on Governor's Island and a few aeroplanes presented through the National Aeroplane Fund to the New York National Guard. The nearest army aeroplane is at the Mexican border.

Mr. Woodhouse, after coming back from the flight, said that New York from the air looks like a city of wonderful toy buildings.

Mr. Hawley and Mr. Woodhouse complimented the students who are learning to fly at Governor's Island and who are candidates for the Aerial Reserve Corps, which was authorized by President Wilson on July 13th and which will go into effect as soon as the House of Representatives approves the appropriation of $13,281,666 for aeronautics which the Senate passed recently. Then the students now learning at Governor's Island and about forty other students, including twenty Harvard undergraduates who are learning to fly, will be enrolled in the Aerial Reserve Corps.

Aviator McMillen Bombards State House

On July 29, Capt. Ralph McMillen, of the Aviation Section of the Nebraska National Guard, flew over Lincoln, "bombarding" the State House. The demonstration was in connection with a war problem engineered by Gen. Phil. Hall, for the edificationn of Lieut. Palmer.

The problem to be worked out covered the invasion of an army which had captured Omaha and had invaded Lincoln where it had stored ammunition in the armory at the state fair grounds and at the state house. The problem for Capt. McMillen to work out was to soar above these places and destroy the buildings with bombs dropped from an aeroplane.

The problem was also for the purpose of trying out some new bombs invented by Major A. E. Haysel, assistant adjutant general. Major Haysel has invented a fuse which can be lit in the highest wind without the aid of matches, and which is perfectly harmless to other explosives carried by the aviator. The aeroplane has been equipped with a strong automobile light with the planes strung with rows of electric bulbs which can be turned on or off at the pleasure of the aviator.

Capt. McMillen left the fair grounds in the presence of Governor Morehead, General Hall, Lieutenant Palmer, Major Haysel, after it had become very dark. His machine arose gracefully, but had reached a height of about 3,000 feet before circling back over the arsenal where he dropped the first bomb. The calculation was good, for despite the forty-mile breeze which Captain McMillen encountered high in the air, the bomb exploded close enough to the arsenal to have blown the building up. The next one was dropped over the city, exploding just above a street car, the force of the explosion knocking the trolley off the wire and causing a commotion among the passengers.

Aero Company for Kansas National Guard

Following receipt of permission from the War Department Adjutant General Charles I. Martin of the Kansas National Guard has begun preparations for organizing an aero company as an additional unit to the State Guards. Captain Phil Billard, of Topeka, who is an aviator, probably will be in charge of the new organization.

L. W. F. Engineering Co. Moves to Larger Quarters

The volume of business which the L. W. F. Engineering Co., of Long Island City, have on hand has made it necessary for them to move their plant. They have now secured a desirable factory at Eighth street and Third to Fourth avenues, College Point, L. I., where work is going on in connection with the Army orders which the company recently secured.

Export of Aeroplanes

During the week of July 30th, aeroplanes and parts were exported to Great Britain to the value of $30,039.

The heat treating process room at the plant of the Curtiss Aeroplane and Motor Corporation at Buffalo

Michigan's First Aero Squadron Formed

Michigan's first aviation detachment has been detailed and will start learning the flying game as soon as pontoons for the L-W-F tractor arrive at Camp Ferris.

The detachment is First Lieut. Alfred Harvey, First Class Sergt. Merl Dolby, First Class Sergt. William Bergan, Corporals Frank E. Root, Arthur Rowe, Milo Rowe; First Class Privates Bernard Suino, Benjamin Eddy; Trumpeter Frank Webb, Private Adolphus Cummins. All are from Ypsilanti, except Suino, whose home is in Calumet.

Model Aeroplanes and Their Motors

There has just come from the press of Moffat, Yard & Co., a very excellent book dealing with the construction of model aeroplanes and their motors, written by Geo. A. Cavanagh, Model Editor of Aerial Age and Secretary of the Aero Science Club.

The model aeroplane serves to create what we may term a preliminary interest in the problems of aeronautical flight. Man is essentially a competitive animal and the sample model leads to the evolution of something better because it is inevitable, once it has become popular, that its individual users shall be impressed with the idea that they must go one better than their competitor. Thus the line of investigations, crude at first, and later stages assumes quite a scientific nature.

Model aeroplanes, the construction and flying, lead people to realize that the problems of flight were, within reasonable limits, precisely identical whether the machine was a full-powered aeroplane or merely a model driven by an elastic motor; that the same forces were at work in both places and that if the model was to succeed beyond limitations possible to the flying story, its design must be approached with almost the same care and attention as that of the aeroplane itself.

This new volume will aid those taking up this new sport very materially in this direction, for it is written by one who has had a vast amount of practical experience and who has a number of world records to his credit. It can be secured by sending one dollar to the office of Aerial Age.

Application of Jeffery's Waterproof Liquid Glue C Quality for Diagonal Planking

We especially recommend this glue for use in combination with canvas or linen between the double planking of diagonally built boats. This glue being in liquid form no heat is required and it is applied the same as ready-mixed paint with a stiff wire bound brush. A heavy coat is given the first series of planks and the canvas then laid on and ironed out smooth; another coat of glue should then be painted over the linen, taking care to well cover it; after that put on the outside diagonal planking and apply nails or tacks in the usual way. The boat will then be found perfectly waterproof and the glue will contract and expand with the temperature.

This material is used by practically all the flying boat builders throughout the country.

Aviation Section 1st Batt. N. M. N. Y. Completes Successful Camp

The Aeronautic Section of the 1st Battalion Naval Militia, N. Y., has just completed a most successful two weeks' tour of duty at their camp at Bay Shore, L. I.

During the entire period of encampment it was possible to use the Curtiss Flying Boat "N. M. N1" six days, due to heavy rains, high winds and fog. During these six days a splendid record was made. The total flights were 100. Total minutes in the air, 1,108. The men were divided into classes for instruction. Two officers and two petty officers were practically qualified, only a few more flights being necessary to let them fly alone.

Lieutenant Lee H. Harris, who commands the Aeronautic Section and who is also the instructor, has been very fortunate in having been taught to fly by three instructors at the Curtiss Schools and two at the Naval Aeronautic Station, Pensacola, Fla., the result being that he has gathered together the good points of all and combined them into a method of his own which has proved to be a most efficient one, as the records show.

Flying will be continued at the Station every week end. It is expected to turn out several aviators before ice prevents further use of the boat.

Sets Aeroplane Radio Record

A world's record for flashing radio messages from an aeroplane in flight was established July 27 by Captain Clarence Culver, of the signal corps aviation school at San Diego of the United States Army, when he succeeded in keeping in constant communication with San Diego while on a reconnaissance flight to Santa Monica and return, a total one way distance of 114 miles, in an aeroplane. The feat is heralded by Army aeronauts as a distinct triumph in the field of radio transmission from moving aeroplanes. The best mark in Europe from heavier than air machines, according to Army aviators, is sixty-five miles.

Captain Culver ascended from the military aerodrome in a Hall-Scott motored Martin tractor No. 50, piloted by Sergeant William Ocker. He flew at an even height of a mile and a half, sending messages every three minutes to Lieutenant W. A. Robertson, who handled the receiving instruments of a private radio station here.

Off San Onofre, seventy miles north of San Diego, Captain Culver's aeroplane skimmed through the center of a huge rainbow. The reflection of the moving aeroplane in the rainbow Captain Culver described as a wonderful sight.

Captain Culver's feat was accomplished with a radio set invented by himself. The power for the transmission set is derived from a generator placed on the lower wing section of the aeroplane and driven by a two-blade propeller. Aerial wires hung from the fuselage, with an insulated counterpoise hung from the wings to the tail of the aeroplane, complete the set, which weighs less than forty pounds.

"With suitable appropriations from Congress we will show that America can regain and retain the lead in the world of aeronautics," said Colonel William Glassford, commandant, in commenting on Captain Culver's achievement.

One of the machine rooms at the Thomas Bros. Aeroplane Co. plant at Ithaca

Chicago News

William H. Couch is out again with his Stupar Tractor. He was flying at Cicero under special permit, the old field having been cut up into streets and abandoned by the fliers a year ago. After a very pretty flight and tryout of his new machine, he was about to make a landing, when about fifteen children ran directly in the way. To avoid mowing them down, Couch went up and over them, only to find a ditch confronting him. On skipping over that, a fence loomed before him. He flew over the fence, but turning too sharply over the railroad track which skirts the old field, he side-slipped down onto the rails from a height of 50 feet. Couch crawled out none the worse for his bad spill. His wrecked plane looked as though it would never fly again, but in spite of coming down full force on iron, it had been refitted and is now as good as ever.

Another case of stout resistance that Chicago aviators are talking about was when Sinclair turned a somersault on wet ground. Neither he nor his Stupar Tractor was injured. Recently, when endeavoring to make a landing, he had to wreck an automobile rather than scalp a lot of sightseers, who ran into his path, but only a few dollars was required to replace broken parts. This particular machine Shank & Callahan had out with a circus for weeks, and it flew twice every day, rain or shine.

To the Pole by Aeroplane

Now Doc. Cook has a plan to reach the North Pole (*again* he puts it) in an aeroplane. He made the announcement lately, adding that several of his friends in the Chicago Aero Club are arranging to finance the project. He will start, he says, in July or August of next summer.

"Ships can now go within 700 miles of the Pole," said the Doc., "and the modern aeroplane can easily make that distance in ten hours. There is land within 400 miles of the Pole and a sea of floating ice comes next. The ice fields are covered with snow, making it practicable to land on them with an aeroplane, and even to establish supply stations for fuel and provisions. This latter will be done.

"Reaching the Pole by flying machine is a much surer and easier method than that followed by explorers up to the present. I probably will be accompanied by Rudolph Franka, who was with me when I reached the North Pole on April 21, 1908."

At Four Flies 2,000 Feet

Harry Joline, four years old, of Philadelphia, qualified as the youngest aeroplane passenger August 6, when he made a half-hour flight over the city at an altitude of 2,000 feet with Aviator Kenneth Jaquith.

Interned Aviator on Parole

J. Erroll Boyd, a Canadian aviator, who was forced to land in Holland after his aeroplane had been damaged by the Germans, arrived in New York on the steamer Noordam on parole. He has given his word to the Holland Government that he would not take any further part in the war if they would let him return to Canada.

Military Aviation

The following aviation students, now at San Diego, Cal., have been ordered to report to board appointed for examination to determine their qualification for rating as junior military aviators in the Aviation Section of the Signal Corps: Second Lieuts. Leo G. Hefferman, 5th Cav.; George H. Brett, 2d Cav.; George E. A. Reinburg, 7th Cav.; John C. McDonnell, 11th Cav.; John C. P. Bartholf, 5th Inf.; John W. Butts, 3d Cav., and Sheldon H. Wheeler, 25th Inf. (July 22, War D.).

Personal Pars

Joe Bocquel, a Christofferson aviator, looped the loop twenty times at San Francisco on July 24, according to press dispatches.

Baxter Adams created great interest by his sensational flying at Grand Forks, N. D. The Grand Forks *Herald* says about the flights:

"The ascension was the prettiest ever seen in Grand Forks, but it was not without difficulty that Adams succeeded in leaving the field. When he arose he swooped toward the Liberal Arts building, and for a moment it appeared that he would crash into the steeple. A clean sweep toward the south placed the craft in safety, but the air currents checked progress incessantly, and when traveling against the breeze Adams was forced to extend his motor to the limit, and then remained stationary for long periods."

Leon Canady, of New York, was severely injured at Overland Park, Kansas City, July 23, when an aeroplane he was driving struck an air pocket and fell about 300 feet to the ground. The machine was wrecked.

Henry Anderson, a wealthy rancher of Reno, Nevada, has ordered a Christofferson tractor biplane, for use on his ranch.

Baxter Adams was in North Dakota last week making exhibition flights at the Fargo fair.

Aviator E. B. Lopp, of the Robinson Aviation Co., of Miami, Okla., traveled with the Brundage Carnival Co. throughout Nebraska and Iowa.

Lieut. T. J. Maroney will fly at the Interstate Fair, September 4, at Uniontown, Wyoming.

W. K. Martin is the instructor for the Pacific Aero Products Company, a recently organized firm in Seattle, Wash.

The Hugo, Oklahoma, chamber of commerce has signed a contract with Harry Weddington, aviator, for a series of six flights during the Choctaw county free fair, to be held during the month of September. Weddington, who is a resident of Hugo, attended a course of instruction at the Florida aviation school and returning home had his plane, which is of the Curtiss type, built in Hugo under his own supervision, and has made more than one hundred flights from the local trial grounds.

Lieutenant Boyd Briggs of Company A of Newcastle, Wyoming's only aviator, has been ordered to leave his company at Camp Kendrick and report immediately for service with the aviation corps on the Mexican border. The order was sent to him by wire from Major General Scriven, of Washington, D. C., through the local United States army recruiting station.

Some of the machines, hangars and workshops at the U. S. Aviation School at North Island, San Diego

SPECIFICATIONS COVERING REQUIREMENTS OF AERONAUTIC INSTRUMENTS FOR THE ARMY

THE National Advisory Committee for Aeronautics has just published in its Report No. 8 the general specifications covering the requirements of aeronautic instruments for the Army, which we reprint herewith in full. We will subsequently publish articles dealing with the detailed requirements of the various instruments mentioned in this report.

Introduction

For the information of those concerned with the use or production of instruments used in the navigation and operation of aircraft, the following general list and specifications have been prepared with a view to indicating the lines on which development is required, and the restrictions and difficulties to be overcome in the design and construction of aeronautical instruments:

Barometer or altimeter.
Compass.
Air speed meter.
Inclinometer.
Drift meter.
Tachometer.
Oil gauge.
Oil pressure gauge.
Gasoline gauge.
Gasoline flow indicator.
Distance indicator.
Barograph.
Angle of attack indicator.
Radiator temperature indicator.
Gasoline feed system pressure indicator.
Sextant.
Aeroplane director.

GENERAL REQUIREMENTS

All indicating instruments required in the navigation of aircraft should be as compact, rugged, and light as is consistent with accuracy, reliability and durability, and with ease of reading. Such instruments must be free from the influence of the following disturbing effects, excepting, of course, those effects on which they depend for their operation, viz., vibration, change of altitude and change of temperature.

Barometer or Altimeter

Barometers or altimeters must be sensitive and of open scale, and the lag in their operation should be the absolute minimum obtainable. When operating in a fog it is essential that the distance above the surface should be known within very close limits. Such instruments, of course, are dependant on barometric pressure and on variations of barometric pressure from the time of the start of a flight until the completion of a flight, which can not be provided for, but aside from this error their indications should be substantially accurate once they are adjusted at the point of departure. It is, therefore, necessary that the scale should be of equal divisions, as otherwise a change of zero to meet change of barometric height will introduce an error. Their location on the aeroplane must be carefully chosen so that their indications will not be influenced by the velocity pressures in flight.

Compass

Compasses should have as high a directive force as is consistent with restricted dimensions. Provision should also be made in the compass mounting for compensating for the presence of magnetic material in the construction of the aeroplane, particularly compensation for heeling and dipping errors. In order that the directive force shall not be abnormally reduced by such compensation, it is, of course, desirable that the structure should avoid the use of magnetic materials in moving parts near the compass location, such as the control columns, shafts, and leads.

Air Speed Meter

An air speed meter should indicate reliably the speed through the air, and should be free from the effects of accelerations, as when the machine is banking strongly in a turn the effect of gravitation is augmented by the presence of the centrifugal force. As the sustaining power of an aeroplane is dependent upon the density of the atmosphere, it is considered that air speed meters which are dependent on the pressure due to velocity will be a safer form of indicator than a true anemometer type.

It is essential that the indicators shall be particularly sensitive and have an open scale reading at velocities approaching a stalling speed, which is the lower limit of safe flying speed. It is also necessary that they should indicate high speeds accurately, in order that excessive speed may be avoided when gliding. Excessive speed in gliding involves danger when a machine is brought up too sharply, as the combination of high speed and the maximum lift factor may readily stress the machine beyond safe limits. Also, when flying at high speed the angles of attack are small, and there is danger of the aeroplane entering a critical condition in which the flow of air may develop radical changes of state, and consequently great changes in the lifting power available. Air speed meters should be capable of calibration immediately prior to a flight. Air speed meters of the Pitot type dependent on a fluid are subject to gravitational errors when banking. They are also subject to error due to heeling or diving. Unless the leads from the Pitot tube to the indicating instruments are sufficiently large, there is also danger of a serious lag in indications.

Inclinometer

Inclinometers of the pendulum or spirit-level type are inaccurate in the presence of accelerations and are only useful as a general check as to the attitude of the machine when flying in a fog. It is very desirable that an indicator free from these defects should be developed. A gyroscopic base line is considered desirable not only for purposes of indicating inclination but as affording a base line for sighting and for the use of instruments of navigation.

Drift Meter.

Drift meters are of two types—one designed for the purpose of indicating leeway over the surface for use in connection with navigation, and the other more properly termed "side slip indicator" for the purpose of indicating whether or not the machine is flying square to the wind. The latter designation is considered preferable for indicating the attitude of the machine. For navigating over the ground the course is readily determined by ascertaining the apparent motion of objects on the surface, and the same method is available for navigating over the water, provided there is a definite object on which to sight. One type of drift meter indicates by the streaking of waves across the objective glass of the instrument as apparent drift, but as the particles of waves themselves which indicate this streaking have a velocity of their own, such indications are subject to error. If the surface wind direction or velocity were known, correction might be made, but when flying at an altitude of several thousand feet it is very likely that the aeroplane itself may be in an entirely different current of air than that present at the surface. In addition to this, tidal currents may also affect the velocity of the water particles. Two forms of side slip indicators exist, the simplest form being that of the well-known string or pennant, but the latter can not be used satisfactorily in the wake of a tractor propeller. The other type consists of a very sensitive pendulum which indicates whether or not lateral accelerations are present, as will be the case for a machine which is not properly balanced laterally, but such an instrument is subject to the defect that if the machine is side slipping laterally at a constant speed, lateral acceleration is no longer present. It can only be depended on to indicate initial disturbances.

Tachometer.

Tachometers should be absolute in their indications, and if electrical should not be subject to disturbances in the conductivity of circuits from any cause, or to deterioration of magnetism of a permanent magnet.

Oil Gauge.

Oil gauges must definitely indicate the amount of oil present in the crank case.

Oil-pressure Gauge.

Oil-pressure gauges must accurately indicate the pressure

(*Continued on page* 675)

NEW HALL-SCOTT ENGINE—TYPE A-7

THE Hall-Scott Motor Car Co., of San Francisco, one of the pioneer construction companies of aeroplane engines in America, has devoted a major portion of its energies to the production of its type A-5 rated 125 h.p., but delivering up to 142 h.p. at 1,230 r.p.m. To meet the demand for a simple and dependable power plant for use in training school and scout machines, this company has now put on the market a new type—A-7, which is a four-cylinder engine rated 90-100 H. P.

It is an interesting fact that the Hall-Scott four-cylinder, although its weight is maintained at an extremely reasonable figure, has such vital parts as crankshafts, crank cases, cylinders, cylinder hold-down studs, main-bearing caps, connecting rods, valves, rocker arms, etc., interchangeable with, or embodying the same strength as the larger and more powerful type A-5 engine.

Careful design by Hall-Scott engineers, together with the exact balancing of every component part entering into the construction of the four and six-cylinder vertical type motors, are responsible for the fact that the vibration in these engines is nearly nil. In disassembling, the four-cylinder has many advantages. Any person with automobile knowledge is competent to overhaul it.

SPECIFICATIONS

Sizes:

This engine has a bore of 5" and a stroke of 7".

Cylinders:

Four cylinders are cast separately from a special mixture of semi-steel, having cylinder head with valve seats integral. Special attention has been given to the design of the water jacket around the valves and head, there being two inches of water space above same.

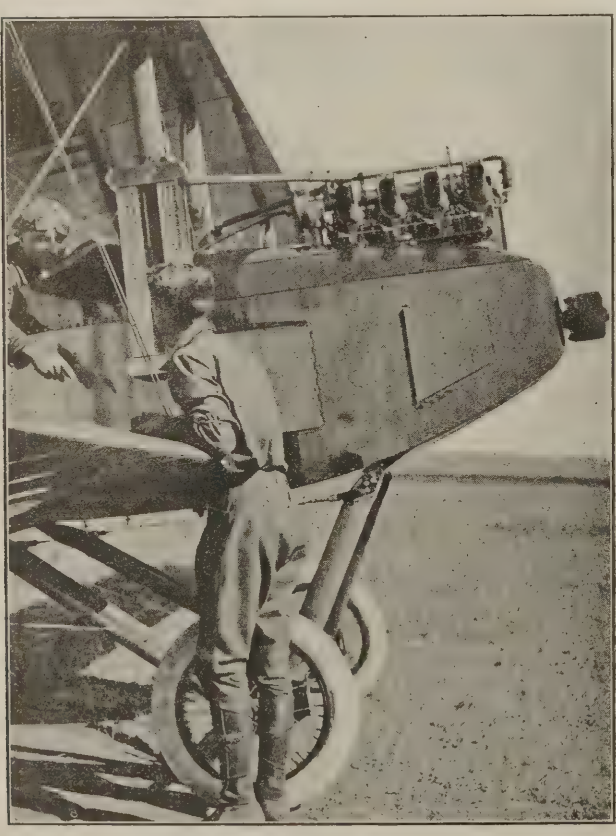
The cylinder is annealed, rough machined, then the inner cylinder wall and valve seats hardened and ground to mirror finish. This adds to the durability of the cylinder, and diminishes a great deal of the excess friction.

All cylinders are finished with dark blue baked enamel.

Connecting Rod:

The connecting rods are very light, being of the I-beam type, milled from a solid Chrome nickel die forging. The caps are held on by two ½"-20 thread Chrome nickel through bolts.

The rods are first roughed out, then annealed. Holes are drilled, after which the rods are hardened and holes ground parallel with each other. The piston end is fitted with a gun metal bushing, while the crank pin end carries two bronze serrated shells, which are tinned and babbitted hot, being broached to harden the babbit. Between the cap and rod proper are placed laminated shims for adjustment.



The four-cylinder, 90 h.p., Hall-Scott engine installed in a special Glenn L. Martin military tractor

Crank Case and Oil Sump:

Crank cases are cast of the best aluminum alloy, hand scraped and sand blasted inside and out. The lower oil case can be removed without breaking any connections excepting one outside oil pipe union, so that the connecting rods and other working parts can readily be inspected. An extremely large strainer and dirt trap is located in the center and lowest point of the case, which is easily removed from the outside without disturbing the oil pump or any working parts.

Carburetion:

A Zenith carburetor is provided. Automatic valves and springs are absent, making the adjustment simple and efficient. This carburetor is not affected by altitude. A Hall-Scott device, covered by U. S. Patent No. 1,078,919, allows the oil to be taken direct from the crank case and run around the carburetor manifold, which assists carburetion as well as reduces crank case heat.

Starting Crank:

The starting crank is mounted in a compact aluminum housing securely bolted to main crank case, thus forming an integral part of the motor.

Gears:

All gears, with the exception of the two bronze oil pump gears, of chrome nickel steel, turned up from extremely light forgings, with planed teeth, are then hardened, the bore and faces being ground true. All gears, where possible, are bolted to flanges or made integral with shaft. All gears are enclosed and run in oil bath.

Magnetos:

Two waterproof four-cylinder Splitdorf "Dixie" magnetos are provided. Both magneto interrupters are connected to a rock shaft integral with the motor, making outside connections unnecessary.

It is worthy of note that with this independent double magneto system, one complete magneto can become indisposed, and still the motor will run and continue to give good power.

Piston Assembly:

The pistons are cast from lynite. These are extremely light, yet provided with six deep ribs under the arch head, greatly aiding the cooling of the piston as well as strengthening it. The piston pin bosses are located very low in order to keep the heat from the piston head away from the upper end of the connecting rod, as well as to arrange them at the point where the piston fits the cylinder best.

These pistons are fitted with three rings ¼" in width. A large diameter heat treated Chrome nickel wrist pin is provided, assembled in such a way as to assist the circular rib between the wrist pin bosses to keep the piston from being distorted from the explosions.

Oiling System:

The oiling system is known as the high pressure type, oil being forced to the under side of the main bearings with from 5 to 30 pounds pressure. This system is not affected by extreme angles obtained in flying, or when the motor is used for push or pull machines.

A large gear pump is located in the lowest point of the oil sump, and being submerged at all times with oil, does away with troublesome stuffing boxes and check valves.

The oil is first drawn from the strainer in oil sump to the long jacket around the intake manifold, then forced to the main distributor pipe in crank case, which leads to all main bearings. A bi-pass, located at one end of the distributor pipe, can be regulated to provide any pressure required, the surplus oil being returned to the case.

Independent of this system, a small direct drive, rotary oiler feeds oil to each individual cylinder, being regulated by the speed of the engine. Hand adjusted sight feed allows additional regulation.

A special feature of this system is the dirt, water and sediment trap, located at the bottom of the oil sump. This can be removed without disturbing or dismantling the oil pump or any oil pipes.

A small oil pressure gauge is provided, which can be run to the aviator's instrument board. This registers the oil pressure, and also determines its circulation.

Cooling System:

The cooling of this motor is accomplished by the oil as well as the water, this being covered by patent No. 1,078,-

919. This is accomplished by circulating the oil around a long intake manifold jacket; the carburetion of gasoline cools this regardless of weather conditions. Crank case heat is therefore kept at a minimum regardless of weather conditions.

The uniform temperature of the cylinders is maintained by the use of ingenious internal outlet pipes, running through the head of each of the six cylinders, rubber hose connections being used so that any one of the cylinders may be removed without disturbing the others. Slots are cut in these pipes so that cold water is drawn directly around the exhaust valves.

Extra large water jackets are provided upon the cylinders, two inches of water space is left above the valves and cylinder head.

The water is circulated by a large centrifugal pump insuring ample circulation at all speeds.

Crank Shaft:

The crank shaft is of the seven bearing type, being machined from a special heat treated drop forging of the highest grade nickel steel.

The forging is first drilled, then roughed out. After this the shaft is straightened, turned down to a grinding size, then ground accurately to size.

The bearing surfaces are of extremely large size, over-size, considering general practice in the building of high speed engines of similar bore and stroke. Steel oil scuppers are pinned and sweated onto the webs of the shaft, which allows of properly oiling the connecting rod bearings. The crank shaft bearings are 2" in diameter by 1 15/16" long, excepting the rear main bearing, which is 4⅜" long, and front main bearing, which is 2 3/16" long.

Two thrust bearings are installed on the propeller end of the shaft, one for pull and the other for push. The propeller is driven by the crank shaft flange, which is securely held in place upon the shaft by the keys. These drive an outside propeller flange, the propeller being long taper on crank shaft. This enables the propeller to be removed without disturbing the bolts.

Timing gears and starting ratchets are bolted to a flange turned integral with shaft.

Cam Shaft:

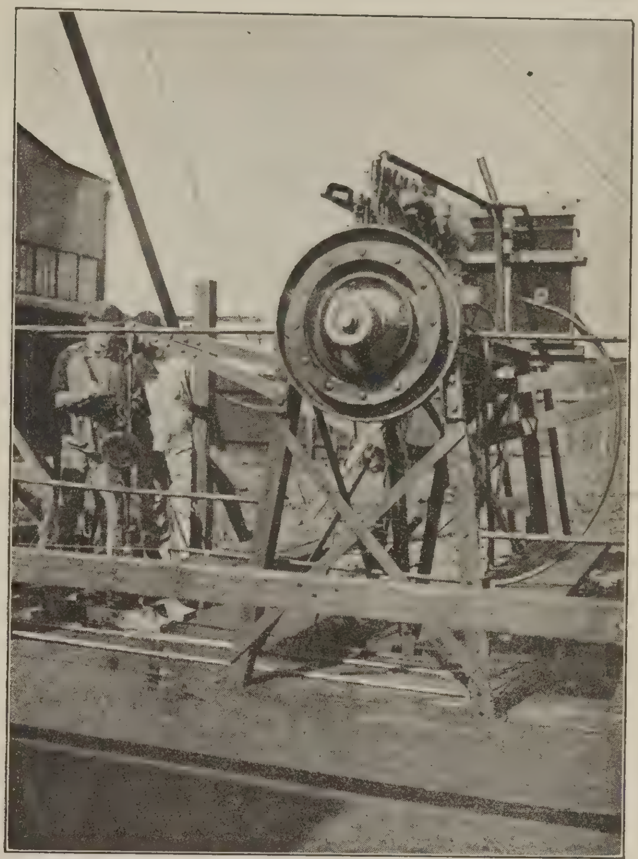
The cam shaft is of the one piece type, cams, air pump eccentric, and gear flange being integral. It is made from a low carbon specially heat treated nickel forging, is roughed out and drilled entire length; the cams are then formed, after which it is case hardened and ground to size. The cam shaft bearings are extra long, made from Parson's White Brass. A small clutch is milled in gear end of shaft to drive revolution indicator.

The cam shaft is enclosed in an aluminum housing bolted directly on top of all six cylinders, being driven by a vertical shaft in connection with bevel gears. This shaft, in conjunction with rocker arms, rollers and other working parts, is oiled by forcing the oil into end of shaft, using same as a distributor, allowing the surplus supply to flow back into the crank case through hollow vertical tube. This supply oils the magneto and pump gears.

Valves:

Extremely large Tungsten valves, being one-half the cylinder diameter, are seated in the cylinder heads.

Large diameter oil tempered springs held in tool steel cups, locked with a key, are provided. The ports are very large and short, being designed to allow the gases to enter and exhaust with the least possible resistance.



A Hall-Scott motor on one of their outside testing plants at their factory at San Francisco, Cal.

These valves are operated by overhead one piece cam shafts in connection with short Chrome nickel rocker arms. These arms have hardened tool steel rollers on cam end with hardened tool steel adjusting screws opposite. This construction allows accurate valve timing at all speeds with least possible weight.

Air Pump:

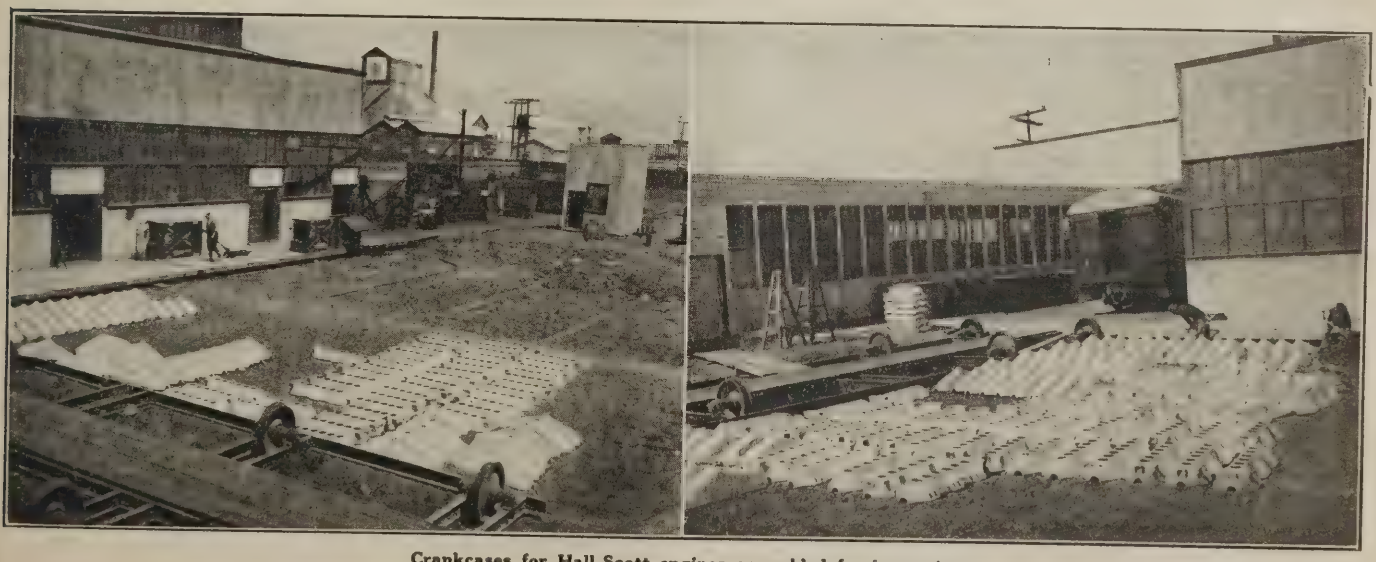
A power driven air pump to maintain air pressure in gasoline storage tank is provided on this engine, driven directly by means of cam formed integral with cam shaft. A hand air pump is also provided so that air pressure may be obtained in the gasoline storage tank before the engine is started.

Weight:

The weight of this engine, complete, ready for installation in aeroplane, 410 pounds.

Capacity:

This engine will develop 90 to 100 H. P. at a speed not greater than 1,400 r.p.m.



Crankcases for Hall-Scott engines assembled for inspection

THE TESTING LABORATORY OF THE AUTOMOBILE CLUB OF AMERICA

THE engine-testing laboratory of the Automobile Club of America was planned with a view to making tests upon which data could be supplied to manufacturers of unquestioned accuracy. The apparatus is handled by experienced men, and the assurance of impartiality is guaranteed by the authority and standing of a long-established organization recognized internationally.

Two distinct classes of tests are made in The Automobile Club of America's Laboratory as indicated below:

(1) Official or Certified Tests. (Results published in full.)

(2) Confidential or non-certified tests. (Result not published.)

The first class of tests is open to the public, and is made entirely by the club under rules which provide for publication in full of the results obtained, whether they be favorable or otherwise.

The second class of tests is of a confidential nature, and is made under an agreement which provides that the record of the results may not be published in any form. Such tests enable manufacturers and inventors to use the Club's Laboratory facilities to obtain data, for their own information, with a view to improving their product or satisfying themselves of its performance. No report of the results is issued by the club in the case of non-certified tests. The apparatus is used by the applicant with the advice and assistance of the laboratory employees, and a copy of the data obtained in tests of this class is turned over without comment for the exclusive use of the concern or individual for whom the test is made.

Engrossed Certificate for Official Tests

There is furnished with each official or certified test an engrossed certificate giving the results obtained. This official record is signed by the Secretary, the Chairman of the Technical Committee and Engineers of the Club. It also bears the name and seal of The Automobile Club of America.

Printed Report of Official Tests

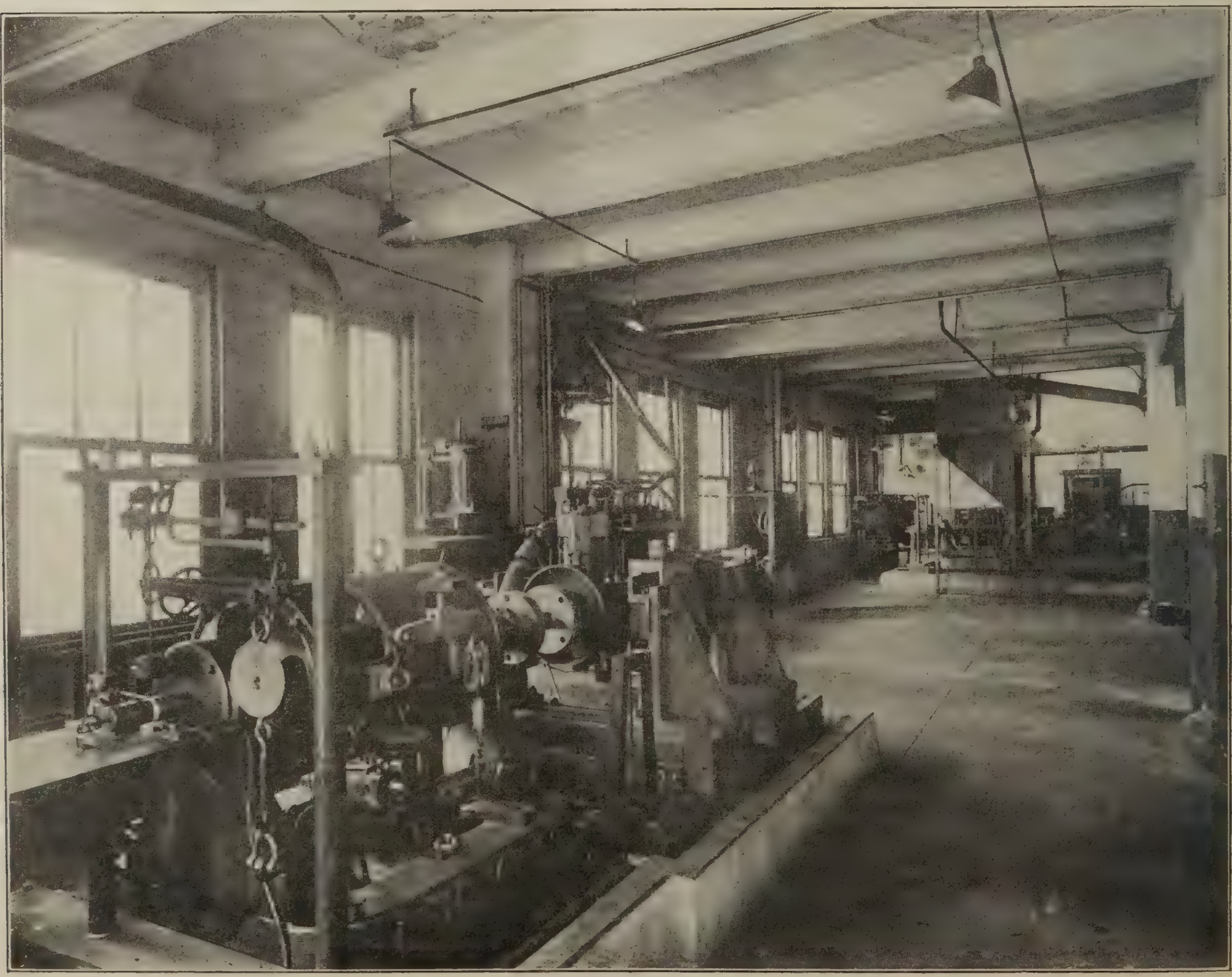
Reports of Official Tests are printed in full in "The Club Journal." Reprints (in the shape of an Official Laboratory Bulletin) can be furnished at a nominal charge.

Charges

The regular charge for the use of the engine-testing apparatus and auxiliary equipment is three dollars ($3.00) per hour. This charge applies during the entire time (or portion of the working day) that the apparatus is held so that it cannot be used for other tests. The charge for engineers, assistants and helpers varies from seventy-five cents ($0.75) to one dollar and fifty cents ($1.50) per hour per man for the actual time that their services are required. (For overtime work labor charges are 50 per cent. to 100 per cent. higher). Fuel, oil and other supplies are furnished at the same rates that they are furnished to members of The Automobile Club of America. The above schedule applies to both non-certified and certified tests.

In the case of certified tests only there is in addition to the above, a single charge of seventy dollars ($70.00) to cover the cost of the engrossed certificate and the preparation of the printed report. The latter appears in "The Club Journal," and is frequently printed in full in numerous other papers.

For endurance tests of motors which continue without interruption for periods of not less than two hundred hours a special rate of $100.00 per day of twenty-four hours is made. This charge includes the use of the apparatus, the services



of two competent observers during the entire time of the test, and the report and certificate, but does not include gasoline, oil and other supplies that may be consumed.

The testing laboratory is now prepared to make confidential certified tests. For these tests a report is written, but it must be kept strictly confidential and must be sent out only by The Automobile Club of America and only to such parties as the client may direct. The charge for preparing this report and including the first three copies is $50, which is in addition to the regular charge for use of equipment and labor, as given above. Additional copies of the report may be had at a nominal cost depending on the nature and length thereof.

Motor Testing Apparatus

Dynamometer Equipment for Measurements of Power.—The Laboratory's dynamometer equipment is very complete. Two up-to-date electric cradle dynamometers are in use. One of these machines is for motors whose speed does not exceed 2,000 r.p.m., while the other can be used up to speeds well above 3,000 r.p.m. These brakes are so designed as to accommodate motors ranging in size from 3 to 120 horsepower.

In addition to the two electric dynamometers the laboratory possesses an Alden brake (adapted to measurement of large power output at low speeds) and a fan dynamometer.

Measurement of Torque.—Torque or turning effort is measured at the end of a 63.025 inch arm. This makes the horsepower calculation very simple.

$$\text{Horsepower} = \frac{\text{Torque} \times \text{R. P. M.}}{1000}$$

A spring balance is used to indicate the torque and momentary variations. The readings of the spring balance are, of course, not relied upon for calculations. For this purpose the torque is accurately measured upon a pair of scales which are sensitive to 0.1 pound.

Measurements of Speed.—All precise measurements of speed are made by positively driven counters so arranged as to be engaged and disengaged at will. Tachometers are used for indicating fluctuations in speed, and for determining when speed conditions become constant. The revoluton counters are used in all cases to determine the average speed over a given period of time. A set of magnetically controlled counters is used for this purpose. These are arranged so that readings may be taken at different intervals without interfering with the total count.

Apparatus for General Measurements

Mechanical Efficiency.—For determining the mechanical losses in a motor, the same dynamometers, used for measurements of brake horsepower, are employed. In this case, however, the dynamometer acts as a motor driving the engine under test. The measurements of torque and speed are accomplished in the same manner indicated above, so that it becomes an easy matter to determine frictional losses in terms of horsepower.

Fuel Consumption—Thermal Efficiency.—The amount of fuel supplied to the motor is weighed over a given interval of time on delicate scales at the same time that the power measurements are taken. This gives the data necessary to calculate the pounds of fuel per brake horsepower hour, and (if the heat content of the fuel is known) the thermal efficiency based on b.h.p.

Heat Losses—Cooling Water—The heat absorbed by the cooling water can be accurately determined. For this purpose, a Venturi meter is placed in the water line leading to the jackets. This, of course, measures the quantity of water flowing per unit of time. Thermometers are placed in the inlet and outlet piping as close to the motor as possible, and from these the increase of temperature of the water as it passes through the jackets of the motor may be determined. From these data, the heat lost to jacket water is readily calculated.

The cooling system is so arranged that motors using either the thermo-syphon or pump system can be accommodated.

Exhaust—The Laboratory has a chemical laboratory equipped to make accurate gas analyses. This is of extreme importance in studying the combustion conditions in the motor. Suitable pyrometers for measuring the temperature of the exhaust gas and manometers for measuring its pressure are also provided.

Air Measurements—Volumetric Efficiency-Mixture Ratio.—The quantity of air flowing through the carburetor is measured with Venturi meters. The accuracy of this type of meter has, of course, been long established. A large chamber is placed between the meter and the carburetor, so that the pulsations of the air passing through the meter are reduced to a minimum. The carburetor is placed in an air-tight box, and the air drawn into the box is measured. In this way no air enters the carburetor that has not passed through the meter.

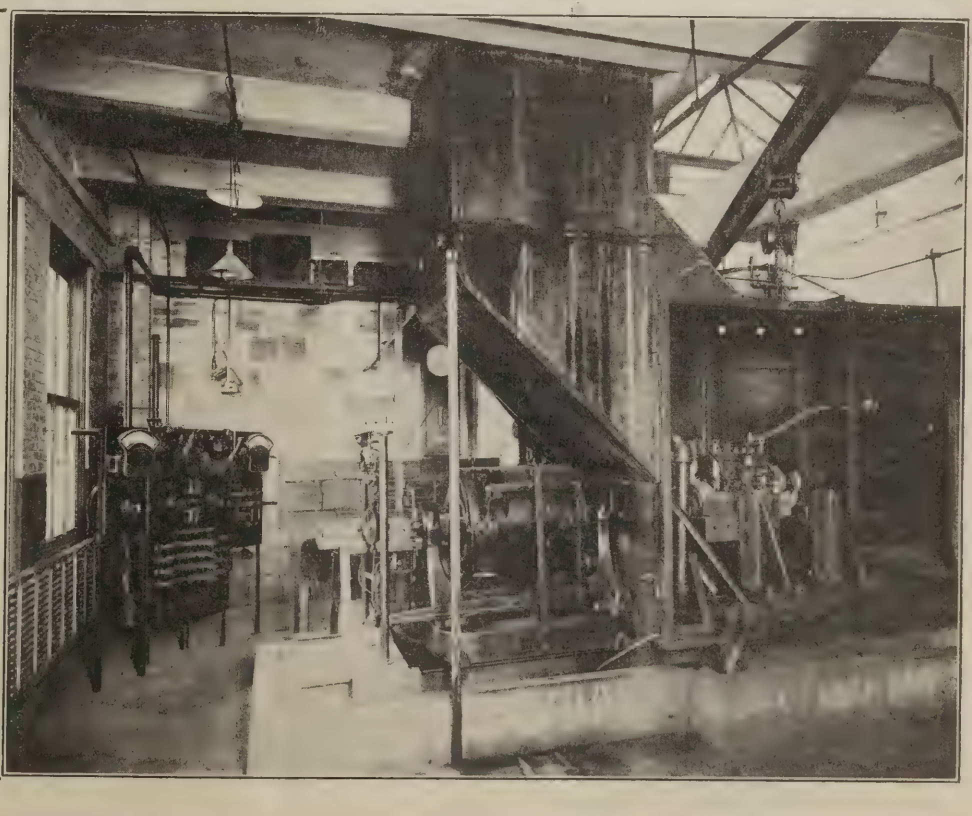
Knowing the displacement of the motor, its volumetric efficiency can be calculated after the quantity of air passing into it is known.

From the measurements of fuel and air consumption, the mixture ratio can be calculated.

Miscellaneous Apparatus

The Laboratory has as a part of its equipment two motors, a 4-cylinder Northway, 4⅛x4¾ (254 cubic inches piston displacement), and a 6-cylinder Pierce-Arrow 4½x5½ (525 cubic

(*Continued on page* 673)



The dynamometer for testing aeronautical engines at the Automobile Club laboratory

DYNAMICAL STABILITY OF AEROPLANES

By Jerome C. Hunsaker, Eng. D.

Assistant Naval Constructor, U. S. Navy, Instructor in Aeronautical Engineering, Massachusetts Institute of Technology
Assisted by T. H. Huff, S. B. D., D. W. Douglas, S. B., H. K. Chow, S. M., and V. E. Clark, Captain U. S. Army

(*Continued from page* 599)

§6. VECTOR REPRESENTATION

A clearer conception of longitudinal balance is obtained by representing the resultant forces acting on the model as vectors. Thus, for case II, we observed on the balance the lift L and drift D. The resultant force acting was then of magnitude $R = \sqrt{L^2+D^2}$. This resultant force lay in a direction making an angle θ given by $\theta = \tan^{-1} L/D$. The line of action of this resultant was at a perpendicular distance from the spindle axis given by $d = M_8/R$, where M_8 is the observed pitching moment about the spindle. The resultant force, R, is thus defined in magnitude, direction, and line of application, and may be represented graphically as a vector. In figure 1, the resultant force vectors for case III are drawn on the side elevation of the model. The model is considered to be fixed and the wind direction to change so that the angle of incidence varies from —1° to +8°. The vectors are, therefore, drawn relative to the aeroplane.

The vector for 2° passes near the center of gravity. If it were desired to balance the machine at some other attitude, 6° for example, the center of gravity should be located at some point on the vector for 6°.

Note that on figure 1, for angles greater than 2°, the vectors pass to the rear of the center of gravity indicating diving moments and *vice versa*. Thus the machine is in stable equilibrium at 2°, and if deviated from this angle, righting moments are at once created which tend to restore the normal attitude.

Such stability is "inherent" in the design of the aeroplane and depends wholly on the location of the center of gravity and setting of the stabilizer. No automatic devices are required which may or may not function in an emergency. The inherent stability here shown is static only. Later we will investigate the effects of inertia and damping involved in dynamical inherent stability. However, dynamical stability is impossible unless there be statical stability, and before undertaking a study of the former property, we were obliged to provide a reasonable righting moment to oppose diving and stalling.

§7. PERFORMANCE CURVES

In the design of this aeroplane, the resistance, and hence the speed for given power, was estimated from tests on wings, body, struts, wires, etc., considered separately. The test results were corrected and expanded to full speed full size, using reasonable corrective factors. As is well known, the resistance of many parts does not increase so rapidly as the square of the speed, on account of skin friction. Making all allowances a speed of over 85 miles per hour was predicted for 110 brake horse-power.

If we use the lift and drift observed on the model $\left(\frac{1}{26} \text{ full size}\right)$ at 30 miles per hour and convert to full size by assuming the "law of squares," the performance is not quite so favorable and a maximum speed of but 75 miles per hour is indicated.

For a stability investigation we are little concerned with the exact speed, and for simplicity, the L and D from the wind tunnel test on the complete model of figure 1 are converted to full size by multiplying by the squares of speed and scale.

A total weight of 1,600 pounds is assumed, corresponding to tanks half full. For any speed V the lift is a function of speed and attitude and must equal the weight W.

By the "law of squares"

$$\frac{\text{Force on Model}}{\text{Force on Aeroplane}} = \left(\frac{30}{26V}\right)^2,$$

hence:

$$V = \frac{30}{26}\sqrt{\frac{W}{L}},$$

where L is lift on model at 30 miles per hour.

For a series of values of L, corresponding to a series of attitudes or angles of incidence, the required speed V was computed. The head resistance of the aeroplane moving at these attitudes and with these speeds was computed from:

$$T = D\left(\frac{26V}{30}\right)^2,$$

where D is drift on model at 30 miles per hour, and T total thrust required.

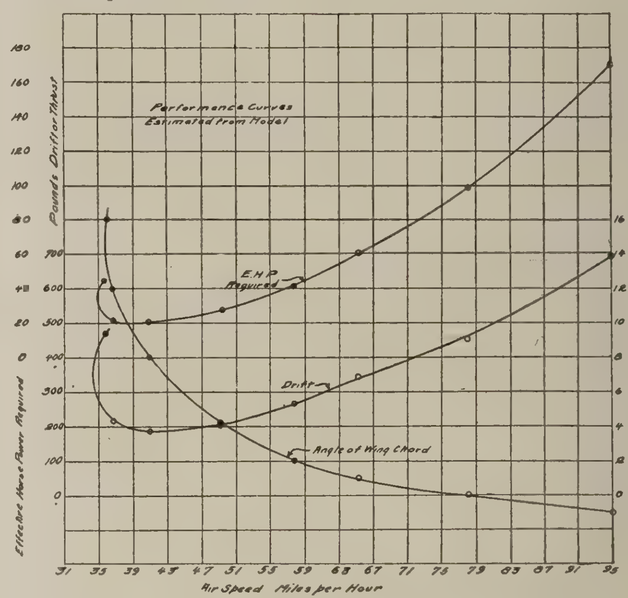


FIG. 6.—Characteristic performance curves.

The effective horse-power required, angle of wing chord to wind and thrust required are plotted as "characteristic performance curves" on figure 6.

§8. AXES AND NOTATION

We shall adopt a notation similar to Bairstow's for the study of dynamical stability. The normal attitude of the aeroplane is its position when in steady flight in a straight line. We select rectangular axes with origin at the center of

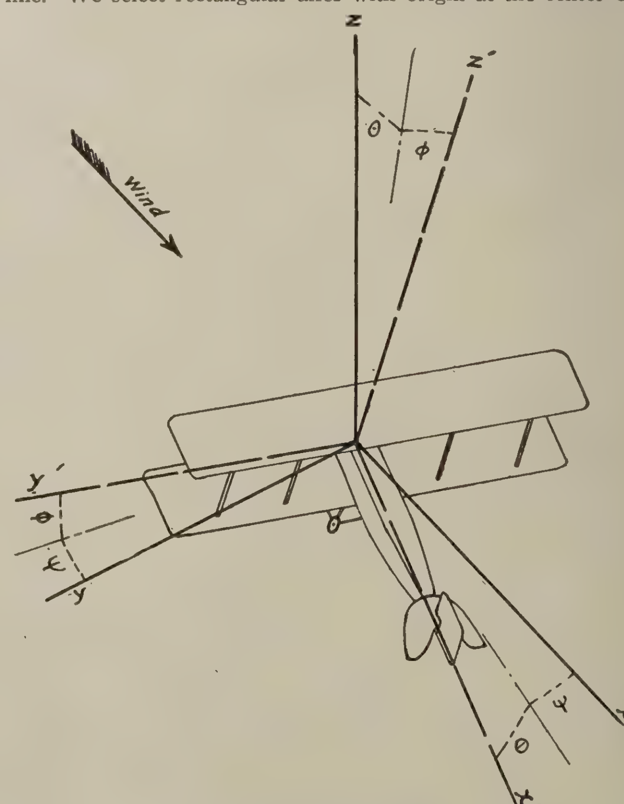


FIG. 7.—Co-ordinate axes, x, y, z.

gravity and fixed in the aeroplane and moving with it in space. In the normal attitude, the axis of x is tangent to the trajectory of the center of gravity with its positive direction toward the rear. The axis of z is normal to x and y in the vertical plane, and the axis of y horizontal and directed to the left. The axes are shown in figure 7. As the aeroplane rolls, yaws, and pitches these axes move with it, so that z is no longer in the vertical plane of x, nor y horizontal.

Let the aerodynamical forces along the axes x, y, z be denoted by X, Y, Z and expressed in pounds force per unit mass.[1] The moments about these axes are L, M, N in pounds-feet per unit mass. Angular velocities about the axis are p, q, r in radians per second. Let angles of pitch, roll, and yaw away from the normal attitude be θ, ϕ, ψ in radians. Signs are positive in the directions xy, yz and zx.

The radii of gyration about the axes x, y, z are K_A, K_B, K_C in feet. The mass of the aeroplane is m in slugs. The products of inertia are D, E, F. Two are zero for reasons of symmetry, and one is small in ordinary aeroplanes.

In normal flight in still air, the apparent wind blows in the positive direction of the axis of x. Let this velocity be produced by the forward velocity U of the aeroplane in normal flight. U is a negative number of feet per second.

Let small changes in velocity components along the axes x, y, z be u, v, w when any departure is made from the normal flying attutude.

In normal flight it is assumed that the power available maintains the aeroplane at such a speed that the weight is sustained and also that the normal attitude is that proper for the speed.

§9. EQUILIBRIUM CONDITIONS AND DYNAMICAL EQUATIONS OF MOTION

Let the inclination of the flight path to the horizontal be θ_0. Since normal flight takes place in a straight line, $\psi_0 = \phi_0 = 0$. There is no oscillation and $p_0 = q_0 = r_0 = 0$, and $L_0 = N_0 = 0$.

If the propeller thrust T_0 be exerted in a line above or below the center of gravity h feet, then

$$M_0 = -T_0 h,$$
$$T_0 = -g \sin \theta_0 - X_0,$$
$$Z_0 = g \cos \theta_0.$$

In this aeroplane $h = 0$, and hence $M_0 = 0$.

If any accidental cause slightly disturbs the normal attitude of the aeroplane, the relative wind is no longer symmetrical and the aero-dynamical forces and moments are X, Y, Z, L, M, N.

In general, the aerodynamical forces and moments caused by the deviation from "normal attitude" depend upon the relative motion of the aeroplane through the air, which motion is defined by U, u, v, w, p, q, r. Thus $X = f\ (U, u, v, w, p, q, r)$ where the form of the function f is not known; and five similar expressions for Y, Z, L, M, N.

In the theory of small oscillations u, v, w, p, q, r are small by hypothesis and we may expand X by Maclaurin's theorem, neglecting squares and products of these small quantities. Hence,

$$X = X_0 + uX_u + vX_v + wX_w + pX_p + qX_q + rX_r,$$
$$Y = Y_0 + uY_u + vY_v + wY_w + pY_p + qY_q + rY_r,$$

and similar equations for Z, L, M, N.

Here X_u, X_v, etc., are the partial derivatives of X with respect to u, v, etc., and are the rates of change of X with u, v, etc. That is,

$$X_u = \frac{\partial X}{\partial U} = \frac{\partial X}{u}.$$

There are, therefore, 36 "resistance derivatives" involved which are constants for the aeroplane and depend upon the arrangement of surfaces and their presentation to the relative wind.

Fortunately, for reasons of symmetry, 18 of these derivatives vanish, for example: X_v, X_p, X_r. We then write:

$$X = X_0 + uX_u + wX_w + qX_q,$$
$$M = M_0 + uM_u + wM_w + qZ_q,$$
$$Z = Z_0 + uZ_u + wZ_w + qM_q,$$
$$Y = Y_0 + vY_v + pY_p + rY_r,$$
$$L = L_0 + vL_v + pL_p + rL_r,$$
$$N = N_0 + vN_v + pN_p + rN_r.$$

The above expressions are only approximate if u, v, w, etc., are not small.

The equations of motion for a rigid body having all degrees of freedom, are:

$$\frac{du}{dt} + wq - vr = X + T_0 + g\sin(\theta_0 + \theta),$$
$$\frac{dv}{dt} + (U+u)r - wp = Y - g\sin\phi,$$
$$\frac{dw}{dt} + vp - (U+u)q = Z - g\cos(\theta_0 + \theta),$$
$$\frac{dh_1}{dt} - rh_2 + qh_3 = mL,$$
$$\frac{dh_2}{dt} - ph_3 + rh_1 = mM + hT_0,$$
$$\frac{dh_3}{dt} - qh_1 + ph_2 = mN,$$

where

$$h_1 = pK_A^2 m - qF - rE,$$
$$h_2 = qK_B^2 m - rD - pF,$$
$$h_3 = rK_C^2 m - pE - qD.$$

But the products of inertia (relative to moving axes fixed in the body) $D = F = 0$, because the aeroplane is symmetrical about the xz plane. Substituting the above expressions for h_1, h_2 h_3, in the equations of motion, and neglecting products of small quantities, we have:

$$\frac{du}{dt} = X + T_0 + g\sin(\theta_0 + \theta), \quad K_2 \frac{dp}{dt} - \frac{E}{m}\frac{dr}{dt} = L,$$
$$\frac{dv}{dt} + Ur = Y + g\sin\psi\sin(\theta_0 + \theta) - g\sin\phi\cos(\theta_0 + \theta),$$
$$K_B^2 \frac{dq}{dt} = M + hT_0,$$
$$\frac{dw}{dt} - Uq = Z - g\cos(\theta_0 + \theta), \quad K_C^2 \frac{dr}{dt} - \frac{E}{m}\frac{dp}{dt} = N.$$

If we substitute for X, Y, etc., their values from the expansion in terms of the first powers of u, v, w, etc., and observing that from the conditions of equilibrium,

$$M_0 + T_0 h = T_0 + X_0 + g\sin\theta_0 = Z_0 - g\cos\theta_0 = 0,$$

we will have, making $\sin\phi = \phi$, $\sin\psi = \psi$, $\sin\theta = \theta$, and $\cos\theta = 1$.

$$\frac{du}{dt} = uX_u + wX_w + qX_q + g\theta\cos\theta_0,$$
$$\frac{dw}{dt} = qU + uZ_u + wZ_w + qZ_q + g\theta\sin\theta_0,$$
$$\frac{dv}{dt} = -rU + vY_v + pY_p + rY_r + g\psi\sin\theta_0 - g\phi\cos\theta_0,$$
$$K_B^2 \frac{dq}{dt} = uM_u + wM_w + qM_q,$$
$$K_A^2 \frac{dp}{dt} - \frac{E}{M}\frac{dr}{dt} = vL_v + pL_p + rL_r,$$
$$K_C^2 \frac{dr}{dt} - \frac{E}{M}\frac{dp}{dt} = vN_v + pN_p + rN_r.$$

We here assume T_0 a constant, or that there is no change of propeller thrust with small change in forward speed. With a motor in "free route," if the machine speeds up, the propeller tends to race or to speed up so that the slip shall be about constant, and hence the thrust is not materially changed. Since the forward speed $(U \pm u)$ is approximately equal to U, the thrust is approximately constant and equal to T_0.

We have also assumed that T_0 lies parallel to the axis of x. At very slow speed this is not exactly the case and T_0 has a small vertical component assisting in sustaining the weight of the aeroplane. At high speeds, T_0 is, however, usually parallel to x and the assumption that it always is so parallel is here made for simplicity. In any case T_0 is eliminated by the conditions of equilibrium.

In the present investigation the normal flight path is assumed horizontal, or $\theta_0 = 0$. The product of inertia E is small for ordinary aeroplanes with the heavy weights fairly symmetrical above and below the axis of x. In view of the probable insignificance of E and the fact that E cannot easily be determined for an aeroplane by simple experiments, it is here neglected. In the simplified form the equations of motion then are:

$$\frac{du}{dt} = uX_u + wX_w + qX_q + g\theta, \qquad (1a)$$
$$\frac{dw}{dt} = qU + uZ_u + wZ_w + qZ_q, \qquad (1a)$$
$$\frac{dv}{dt} = -g\phi - rU + vY_v + pY_p + rY_r, \qquad (1b)$$
$$K_A \frac{dp}{dt} = vL_v + pL_p + rL_r, \qquad (1b)$$
$$K_B^2 \frac{dq}{dt} = uM_u + wM_w + qM_q, \qquad (1a)$$
$$K_C^2 \frac{dr}{dt} = vN_v + pN_p + rN_r. \qquad (1b)$$

It is seen that equations (1a) involve only the longitudinal motion or motion in the plane of symmetry xz of the aeroplane, since p, r, v,

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THE BERLING MAGNETO

IN the clouds the magneto is the most vital part of the aeroplane. Yet few people, even airmen themselves, know much about the construction of the little device which gives the motor its vital sparks. Therefore, on the theory that the readers of AERIAL AGE want to know something about how a high-grade magneto is made, we present this description of the making of the Berling magneto, at the factory of the Ericsson Manufacturing Company, at Buffalo, N. Y.

The main building, devoted to the manufacture of the Berling, has over 50,000 square feet of floor space and is of the most approved form of brick mill construction. The best of lighting and adequate ventilation do their share in maintaining a high standard of efficiency in manufacture. A separate building contains the heating plant, blacksmith shop and hardening department, as well as the lunch room for the employees.

The location of the plant, just outside of the Buffalo City Line, and on about thirteen acres of ground adjacent to the New York Central Railroad, provides excellent facilities for the receiving of raw materials and shipping finished product.

Starting with the magnet steel the metal is tested under very rigid specifications. It must have a certain chemical analysis and samples from each lot purchased are first tested by means of delicate instruments to determine the magnetic characteristics. Certain pieces of the steel are hardened and tested, and if up to standard the magnets are made.

Even then each magnet passes through another careful test in order to eliminate all possibility of an inferior magnet getting into a Berling magneto.

The temperature of the oven in which the magnets are heated for forming, and, later hardening, is accurately maintained within a narrow range of temperature, as indicated by a pyrometer. The furnaces burn crude oil. This is forced into the furnace with compressed air—a method which furnishes a very flexible arrangement for controlling the temperature. When hardened, the magnets are ground to size, cleaned and painted. Now they are ready to be magnetized and placed on the magneto.

A feature of the Berling magnetos is that the magnets are not drilled, but are held in place by means of a strap or band of brass. This eliminates the cracking in the process of hardening, and permits a great degree of hardness with a consequent greater permanency.

The armature looks like a simple thing if it is removed from the magneto all complete, but it is made up of a great number of parts. Take, for instance, the core, around which the winding is placed. This is made of many piece of fine "electrical sheet" iron, in the form of laminations with malleable iron core ends.

In the Punch Press Department these laminations for the armature, the mica and condensers, and all other punch parts entering into the magneto are punched.

The armature, consisting of the laminations and ends, is first assembled and machined, then it is sent to the winding room where it is carefully insulated, and the primary winding of heavy wire is put on. In the winding room the armatures are wound and the mica for the condensers is split and tested and the condensers assembled. In the ovens in the winding room the armatures are baked after having been completed.

The girls are very carefully trained and are required to become proficient in winding before being permitted to work on production work. The work is carefully supervised by inspectors who are constantly watching the work in progress. The girls are first taught winding by working on the simplest types of armatures and as they become proficient are permitted to handle work on larger and more complicated types. From sixty to seventy skilled employees work in this department.

After the primary winding comes the secondary winding of thousands of turns of very fine wire. The very best grade of copper wire covered by a protective coating of enamel is required for this purpose. Here the skill of the operator is needed as the wire breaks easily and must be handled carefully. Also each turn must lie close to the turn adjacent, in order to get all the turns possible in the space allowed.

The girls put on the high tension winding on the armatures. The armature is held in a clamp and the wire put on in layers, each layer being insulated from the other by a sheet of insulating material.

This work requires great care as a short circuit between any two layers will materially reduce the efficiency of the magneto.

Each layer is insulated from the layer above and below it and the ends of the layers especially protected.

When the winding of the secondary is finished, the leads are brought out and the winding is then taped and varnished and finally baked in an electric oven for several hours.

A very essential part of the magneto is the condenser, because if anything happens to it the interrupter contacts are soon burned away and the magneto will fail to ignite the motor.

The operators gauge mica for the condensers by means of a micrometer. The very best quality of mica is used and this is split to the proper thickness by operators who become very proficient in this work. Although it is necessary to gauge every piece, using a micrometer, the girls become so proficient that they can judge with their fingers the thickness and will sometimes split a handful of mica, and on gauging its thickness find every piece correct.

The Berling condensers are all made of tinfoil and mica. The superiority of mica is unquestioned, although its cost frequently leads manufacturers to use substitutes. The mica is purchased in sizes a little larger than required, and is first split to the required thickness. The allowable limits of thickness are very close, and the thickness of each piece is measured with a micrometer. The parts that pass are sent to the press department and punched and perforated to the correct size and shape. They are then returned to the winding room where each film receives another test to determine if it has any defect or pin hole.

The mica is tested for pin holes before being assembled into the condenser. Each sheet is laid on a plate and tested with a high tension current. This indicates any defects or holes, and pieces thus discovered are thrown out. This careful test is essential to the building of a condenser which will give permanent service.

Each film is laid on a metal plate connected to one side of a high voltage current and then a pointer is passed over the film, and if there are any cracks or holes, the current will jump through, thus pointing them out clearly to the tester. These films are thrown out. Those which pass the test are then used to build the condenser.

The condensers are built of alternative layers of mica sheets which have passed the test just described and sheets of tinfoil. These are carefully laid, one above the other, and are held together by a small quantity of insulating material. After being assembled they are clamped together, compressed slightly and baked. Every condenser, after compression, is tested and must be within the required range of capacity. Thus the capacity and the insulation resistance of the completed condenser are measured and must come up to specifications in both respects.

After the armature leaves the winding room it goes to the electrical testing department where it is carefully tested and is then sent to the armature assembly department where it is assembled with the driving and interrupter ends, condenser, collector spools, pinion and ball bearings and then carefully trued up and turned to the proper diameter.

As the efficiency of the magneto depends to a considerable extent on the smallness of the air gap between the armature and the pole piece, this turning is done on the ball bearings of the armature itself and carefully micrometered to accurate size.

Equal care must be used in machining the frame if the air gap is to be kept small. The photograph shows one of the frames of a Berling magneto in the screw machine being machined. One of the very desirable features of the Berling magneto is the frame construction, as the pole pieces, base, top and interrupter and bearing are all incorporated in one casting, making a perfectly rigid frame with no screws to be lost or parts to work loose. Most of the machining is done in the main building. The lighting of the entire shop is excellent.

The making of the cams and cam housing on Berling magnetos is interesting as they are made from one piece of drawn steel. After going through several operations in the punch press department, thev are hardened and ground to size. Perfect smoothness and extreme accuracy are demanded and a special grinding fixture has been designed to do this work. As the cams and cam housings are of one piece, it can be readily understood that there are no parts to come loose, and the accuracy of the cam once made is absolute and cannot change.

All the parts coming from the different departments after operations are completed go to the inspection department, sometimes between operations in the same department, always when going from one department to another or to the stock

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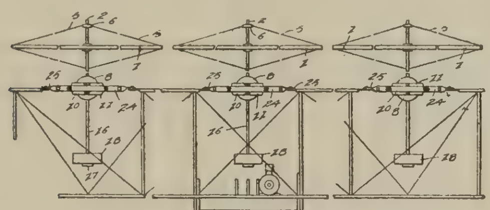
RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,178,318. STABILIZER. Joseph Herbeck, Los Angeles, Cal., assignor of one-half to James Mackin, Los Angeles, Cal. Filed July 15, 1915. Serial No. 40,109. (Cl. 244—29.)



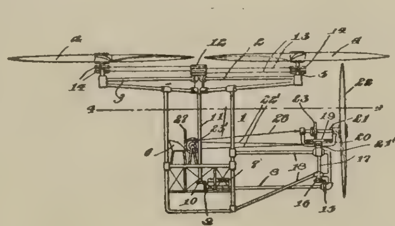
1. In a stabilizer for airships, the combination of a rotatably supported sphere, a pipe detachably connected to said sphere, a wing fixed to said pipe, a second pipe detachably connected to said sphere at a point diametrically opposite of the connection between said sphere and said first namel pipe, and a weight detachably mounted upon the lower end of said second named pipe.

2. In a gravity stabilizer for airships, the combination of a rotatably supported sphere, a pipe detachably connected to and extending upwardly from said sphere, a wing fixed to said pipe, a second pipe detachably connected to said sphere at a point diametrically opposite of said first named pipe, a collar mounted upon the lower end of said second named pipe, a weight being provided with a radial recess, a pair of transversely extending recesses communicating with said radial recess, and a key inserted in said transversely extending recesses for locking said weight upon the lower end of said pipe.

3. In a gravity stabilizer for airships, the combination of a pipe, a wing fixed to said pipe, guy wires connected to said wing and said pipe, a sphere detachably connected to the lower end of said pipe, means for rotatably supporting said sphere, a second pipe detachably connected to said sphere at a point diametrically opposite of said first named pipe, said second named pipe extending outwardly and downwardly from said sphere, a weight detachably mounted upon the lower end of said last named pipe, and means for holding said weight upon said last named pipe.

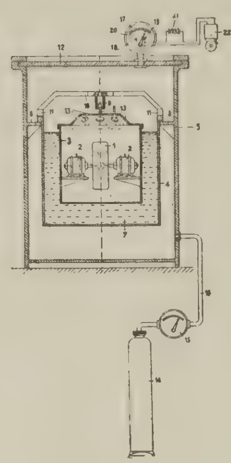
4. In a gravity stabilizer for airships, the combination of a pipe, a wing fixed to said pipe, guy wires connected to said wing and to said pipe, a sphere detachably connected to the lower end of said pipe, a pair of members detachably connected for forming a bearing structure, anti-friction ball bearings mounted within said bearing structure and engaging the surface of said sphere, a second pipe connected to said sphere at a point diametrically opposite of said first named pipe, said second named pipe extending downwardly from said sphere, and a weight detachably mounted upon the lower end of said second named pipe.

1,181,019. FLYING-MACHINE. Charles D. Lansing, Ashtabula, Ohio, assignor of one-ninth to Harry W. Leuthi, one-ninth to C. Stuart Mygatt, and one-ninth to Fred R. Hogue, Ashtabula, Ohio, and one-fifteenth to Ora T. Fell, Youngstown, Ohio. Filed May 5, 1915. Serial No. 26,116. (Cl. 244—25.)



A flying machine including a frame structure, sustaining means carried thereby, a motor, a vertical shaft driven therefrom, a yoke swiveled upon said shaft, a horizontal friction disk carried by the shaft, a shaft journaled upon the yoke, a driving propeller carried by said shaft, a friction disk feathered to slide upon and rotate with the propeller shaft and adjustable over the face of the first named disk, means for adjusting said adjustable disk, and means for swinging the yoke laterally in either direction.

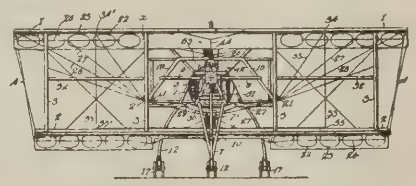
1,180,815. GYROSCOPIC COMPASS. Hermann Anschütz-Kaempfe, Neumühlen, near Kiel, Germany. Filed July 16, 1914. Serial No. 851,265. (Cl. 74—78.)



1. An apparatus of the class described comprising a tank gas lighter than air contained in said tank, and a gyroscope mounted in said tank to operate in said gas.

2. In an apparatus for reducing surface friction in gyroscopic compasses, the combination with a gyroscope, of a tank, and gas under pressure and lighter than air contained in said tank, the gyroscope being mounted in said tank to operate in said gas.

1,139,860. FLYING-MACHINE. Giovanni Grandini, Chicago, Ill. Filed Oct. 8, 1914. Serial No. 865,613. (Cl. 244—29.)



1. A flying machine comprising a main transverse plane, a car provided with elevating and steering rudders, an intermediate frame of a skleeton arch form connected at its crown to the car by a longitudinal pivot and at its depending side portions to the main plane by transverse pivots, and a transverse bracing connection attached to the respective ends of the main plane and having a sliding bearing at the underside of the car, substantially as set forth.

2. A flying machine comprising a main transverse plane, a car provided with elevating and steering rudders, an intermediate frame of a skleeton arch form connected at its crown to the car by a longitudinal pivot and at its depending side portions to the main plane by transverse pivots, a transverse bracing connection attached to the respective ends of the main plane and having a sliding portion moving in a guideway on the underside of the car, and means on the car for latching said sliding portion against movement, substantially as set forth.

3. A flying machine comprising a main transverse plane, a car provided with elevating and steering rudders, an intermediate frame connected to the car by a longitudinal pivot and to the main plane by transverse pivots, a transverse bracing connection attached to the respective ends of the main plane and having a sliding portion moving in a guideway on the underside of the car, and means on the car for latching said sliding lever engaging said sliding portion against movement, the same comprising a latching lever engaging said sliding portion and an operating lever disposed adjacent to the operator's seat and operatively connected to said latching lever, substantially as set forth.

4. A flying machine comprising a main transverse plane, a car provided with elevating and steering rudders, an intermediate frame connected to the car by a longitudinal pivot and to the main plane by transverse pivots, a transverse bracing connection attached to the respective ends of the main plane and having a sliding portion moving in a guideway on the underside of the car, and means on the car for latching said sliding portion against movement, the same comprising a latching lever engaging said sliding portion and a laterally shifting seat having operative connection with said latching lever, substantially as set forth.

FOREIGN NEWS

FRANCE

The activities of the French flyers during the week of July 30th are as follows. All accounts based upon official reports:

Bert Hall, the American with the French air corps, brought down his third enemy aeroplane. The next aeroplane brought down will entitle him to the Legion of Honor. He encountered three German aeroplanes while flying at great altitude over the German lines. He dived out of range of the three and encountered one further below. Firing at it with his machine-gun, he riddled it with shot, and it fell crushed to the ground. The wings of Hall's machine were riddled with shot by the German fire.

On the morning of July 27th, Lieut de Terline encountered two German aeroplanes. He opened fire, but his machine-gun jammed, whereupon he dashed full into the German machine and both fell to earth. De Terline had already received the military cross for bringing down two enemy aeroplanes. In the Region of Amiens French aeroplanes fought 34 battles, in the course of which five German machines were brought down. On the night of July 28th, 207 shells were dropped on bivouacs, depots, and railway stations on the German front.

Lufberry, an American with the French aeroplane corps, brought down a Fokker. Rockwell was engaged in combat with a German machine when an officer of the corps came up behind him and finished the work of bringing the machine down. The official communique cites Hall's second Boche.

On August 2nd along the Somme front French aviators showed great activity. Thirty-three encounters took place. One German machine, attacked by two Nieuports, fell in flames, while fourteen other machines, seriously damaged, were seen to fall or dive behind their own lines.

Aviator Lenoir brought down an enemy aeroplane which fell behind its own lines on the north of Verdun. It was the fifth aeroplane brought down by this aviator to date. Another German machine was attacked near Etain and fell shattered to the ground.

Sergeant Chanait had two aerial combats and in each case conquered his adversary. These two new victories make a total of eight machines brought down by this aviator. Another German machine attacked by French machines fell near Chauny.

Guynemer and Navarre are now tied for the position of leading aviator with the French armies. Navarre has sent his congratulations to Guynemer and said, "As soon as I return to the front I will begin to surpass your mark." Guynemer reports that it is very hard to get the Germans to come up and fight. He says that if a French aviator wishes to give battle he always has to fly over the German lines. The German aviators come up but try to lure the French down in low range of the German anti-aircraft guns. It is reported that Aviator Gilbert will marry the woman who aided him in his escape, having divorced his former wife.

August 3rd: The announcement comes from France that the Germans are building biplanes of exceptional power and size for use as hydro-aeroplanes. One of them has a wing spread of seventy-five feet, with four motors, and is able to carry six passengers. Another has a wing spread of 137 feet, with three motors of 200 h. p. each. The French remark at this point that the machine must have flown very poorly, for the machine has nowhere been met.

Aviator Charles R——— was killed on July 27th while bringing down his third German machine.

August 4th: French aeroplanes destroyed on the Somme front a German captive balloon. Thirty-four machines participated on a raid in the region of Verdun. Thirty-two bombs were dropped on the Stenay station and eighty-four on the Montmedy and Sedan stations and bivouacs in the region of Damvilliers.

GREAT BRITAIN

The British achievements, as based on the official reports, for the week of July 30th are as follows:

July 30th: Three airships raided the east of England. Thirty-two bombs dropped. No material damage and no casualties. Anti-aircraft guns at one place drove off the raiders. Zeppelins flew over Holland and were fired upon.

July 31st: Zeppelins raided England. Driven off by an aeroplane. No important damage. R. F. C. carried out several bombing raids, dropping seven tons of bombs on enemy communications and billets. One train blown up. Ammunition depot destroyed and a hostile aeroplane on ground destroyed. Many aerial combats and several enemy machines driven to the ground in a damaged condition. Three British machines missing.

August 2nd: Number of airships crossed the coast of eastern countries shortly after midnight on August 1st. Considerable number of bombs dropped. Damage not yet ascertained. Many anti-aircraft guns in action. One Zeppelin damaged.

August 2nd (evening): Aeroplanes in co-operation with artillery destroyed seven gun emplacements and six ammunition dumps. A few hostile aeroplanes crossed British lines. Were driven back and one brought down.

August 3rd: Two enemy aeroplanes brought down in northern section of lines. Three British machines brought down. Hostile aeroplanes bombarded shipping on the Suez canal. No damage was done.

August 4th: British naval aeroplanes carried out a successful raid on August 2nd on a German aerodrome and ammunition depots in towns south of Ghent, Belgium. Two tons of explosives were dropped and considerable damage was done. One of the British aeroplanes with Flight Lieut. Baudry is missing and is believed to have been brought down. The remaining machines returned unharmed.

GERMANY

When the Zeppelin airships raided the English east coast on the night of July 28th, a statement issued by the German Admiralty today asserts bombs were dropped on the British naval bases of Grimsby and Immingham. Despite the fire of anti-aircraft guns, all the airships returned home undamaged. The statement reads:

On the night of 28th our naval airship squadron attacked the English east coast. Bombs were dropped on the railway plants at Lincoln, in industrial establishments near Norwich, on the naval bases at Grimsby and Immingham, and on patrol vessels off the Humber. The lighthouse at the mouth of the Humber was destroyed.

Despite being fired at with incendiary projectiles all our airships returned undamaged to their hangars.

Commenting on the German official statement regarding the Zeppelin airship raid on the English east coast July 28 the British Admiralty stated: "This German report is full of the usual inaccuracies."

The following is the German official report for July 31st:

"An enemy aeroplane attack on Conflans was answered by a bombardment of Pont-à-Mousson.

"A French aeroplane squadron sent against Muelheim and Baden was stopped near Neuenburg by our Fokkers and put to flight. In the pursuit the leading enemy aeroplane was brought down northwest of Muelhausen.

"Lieutenant Hohendorf put his eleventh enemy machine out of action north of Bapaume. Lientenant Wintgens brought down his twelfth aeroplane east of Peronne. A French biplane was brought down west of Pont-à-Mousson and another was destroyed south of Thiaumont by anti-aircraft guns."

On August 4th, two German aeroplanes flew from the Dardanelles over the Island of Lemnos and dropped bombs over the aerodromes of the Allies. The aeroplanes were driven off by warships of Great Britain.

The German viewpoint of the raid of July 31st over Great Britain, as told in their official reports, is as follows:

"During the night of August 2, a great number of our naval ships again attacked the southeastern counties of England and successfully dropped a great number of explosives and fire bombs, especially on London, the fleet base at Harwich, on railway works, and on, from a military viewpoint, important establishments in the County of Norfolk.

"On the approach the airships were attacked by enemy light forces under the rays of numerous searchlights, but all returned undamaged."

It is reported in the German official report for Aug. 3rd that a British machine was brought down south of Roulers, and one aeroplane, the thirteenth for Lieut. Wintgens, southeast of Peronne. One enemy aeroplane was brought down by the fire of the German anti-aircraft guns near Boesinghe and another North of Arras.

German hydroplanes again attacked the Russian aero station at Arensburg on August 2nd and obtained several hits on establishments. Russian battleplanes ascended in pursuit, but were not successful. The German raiders returned unharmed.

Two enemy biplanes were brought down on August 4th.

The following is a semi-official report of the Zeppelin raid of August 4th:

"At Harwich the naval force in the harbor was twice attacked and the dock and railway works were abundantly bombarded. In the County of Norfolk, industrial buildings and searchlight installations at Norwich were successfully attacked. Then bombs were dropped on Lowestoft, where a number of fires broke out in factories.

"British sea-planes which attacked the airships were forced to retreat."

ITALY

Teutonic aviators dropped bombs on the villages of the Degano Valley, on July 31st, causing several fires which were extinguished.

On August 1st, at 7:30 A. M., an Italian air squadron, comprising fourteen battleplanes, flew over Istria. A German pilot ascended, and, according to a German report, brought down one of them.

The following is the official Italian report for August 2nd:

"In the Upper Degano Valley the enemy artillery fired on Forni Avoltri with incendiary shells. We retaliated by partially destroying Mauthen, in the Gail Valley.

"As enemy aircraft had on July 27th attacked Italian open towns on the lower Adriatic without any military object, one of our strong Caproni squadrons yesterday bombarded the Whitehead torpedo and submarine works, three kilometres west of Fiume. In spite of the heavy fire of anti-aircraft artillery and attacks by enemy aeroplanes, our aviators succeeded in dropping four tons of high explosives, which did much damage to the works and set them on fire. During the aerial engagement one enemy aeroplane was brought down above Muggia. One of our Caproni machines was observed landing near Volosca. The others returned safely."

On July 28th, Austrian aeroplanes attacked Bari, Mola di Bari, Molfetta, and Otranto, seaports on the Adriatic. Two persons were wounded at Bari and five killed and twenty wounded at Molfetta. There was some slight damage to buildings at Mola di Bari.

The aeroplanes flew high but, according to official reports, some of them were struck by Italian artillery fire.

On July 30th, enemy aeroplanes harmlessly dropped bombs on Ala and Fiera di Primiero.

RUSSIA

The official Russian report for July 29th is as follows:

"Western Front—On July 28th, one of our air squadrons, consisting of ten aeroplanes, made a successful raid upon Baranovichi, throwing bombs on the railway station buildings and rolling stock. A few fires were observed. North of Lake Miadziol, Ensign Thompson, in a Nieuport machine, pursued an enemy albatross, which appeared over the town of Budislavas, to the town of Kobylniki. The albatross withdrew in a northwesterly direction, and Ensign Thompson, after bombardment with his machine-gun of a camp near the aerodrome in the vicinity of Kobylniki, returned safely."

The following is the official report for August 2nd:

"An enemy aeroplane bombarded a transport containing wounded near Dusitchi, on the Vladimir-Volynski-Lutsk route, killing one and injuring twenty already wounded men. The same aeroplane also bombarded the divisional hospital in Dusitchi, killing one and injuring eight hospital orderlies.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

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MODEL AERO CLUB OF OXFORD
Oxford, Pa.

National Model Aeroplane Competition

The reports thus far received from the various Model Clubs participating in the National Model Aeroplane Competition have been very gratifying. But, although a number of new clubs have been organized since the commencement of the competition, and from which satisfactory reports have been received, the desire is to make this a truly national competition with rivalry from all the States.

At this time when interest in Aeronautics is aroused to the highest pitch and types of machines are being brought to such a wonderful state of perfection, a wide field for activity opens for those men who are especially trained and who have had actual experience in problems of construction.

This should have a strong appeal to young men, particularly in this country, and encourage the best inventive talent which we have and desire to bring out—one of the reasons for the National Model Aeroplane Competition.

The broad national program just established in military aeronautics will require nearly three hundred fliers and over two thousand men, and in order to secure this number a great many more will have to be trained in aviation.

The tremendous military development upon such an extensive scale is going to result in a consequent enlargement of opportunities in the commercial field, and the aeroplane is going to be as common and of as much importance to the young men of the Nation as is the automobile of today.

The National Model Aeroplane Competition is open to all the Model Aero Clubs in America.

If there should be no model club in your part of the country, get together six young men interested in aviation and send to the Contest Committee of the Aero Club of America for information concerning the National Model Aeroplane Competition, or see Aerial Age, Vol. 3, No. 6.

The Aero Club of America has donated a large sum of money to be awarded to the winners of the different contests, the rules of which were designed to make it possible for the inexperienced to participate in these contests.

In addition the experience gained from building and flying models will prove to be invaluable as the aeronautical industry advances.

Illinois Model Aero Club

Last Sunday a large number of I. M. A. C. members were at Ashburn to welcome back Mr. E. M. Laird from his exhibition tour through the West. While he was away, Laird successfully filled three two-day exhibition dates, looping the loop and flying at night with fireworks.

Mr. Chas. Arens brought out his new tractor equipped with a 35 H. P. Anzani motor. Mr. Laird made two straightaways with the plane. Laird remarked that the plane was well balanced and handled good. The workmanship is such that it reflects great credit upon Charlie (Lotch) Arens, and we are all hoping he will be as successful with this as he was with models.

Laird gave a fine exhibition of steep climbing, banking and looping in his own machine. He ended the day's flying by carrying as passenger his brother, Charlie, and his mechanician, George Weaver, former secretary of the I. M. A. C.

On Tuesday Laird tried out his little Excelsior motorcycle-motored plane. It rose quickly and climbed well, showing a large reserve of power, but overheating of the motor limited the length of flights.

On the morning of Thursday, July 27, the Club held its final meet with hydros. Ellis Cook made the best flight, with a duration of 97 seconds, while the other good flights were: Lucas, 86 seconds; Pease, 84 seconds; Lathrop, 83 seconds, with a single tractor hydro, and Likosiek with 60 seconds.

MODEL AEROPLANE AND KITE FLYING CONTEST

At Wildwood, N. J., August Nineteenth, 1916

Model Aeroplane events: Hand launched, distance and duration.
R. O. G. distance and duration.
Other events will be held if a sufficient number of machines can be secured to warrant the purchase of prizes.

Prizes:— Large cups for the winners of every event—medals for second place and possible medals for third place (according to the number of entries).

Rules:— The official rulings of the Aero Science Club of America will be used in all cases.

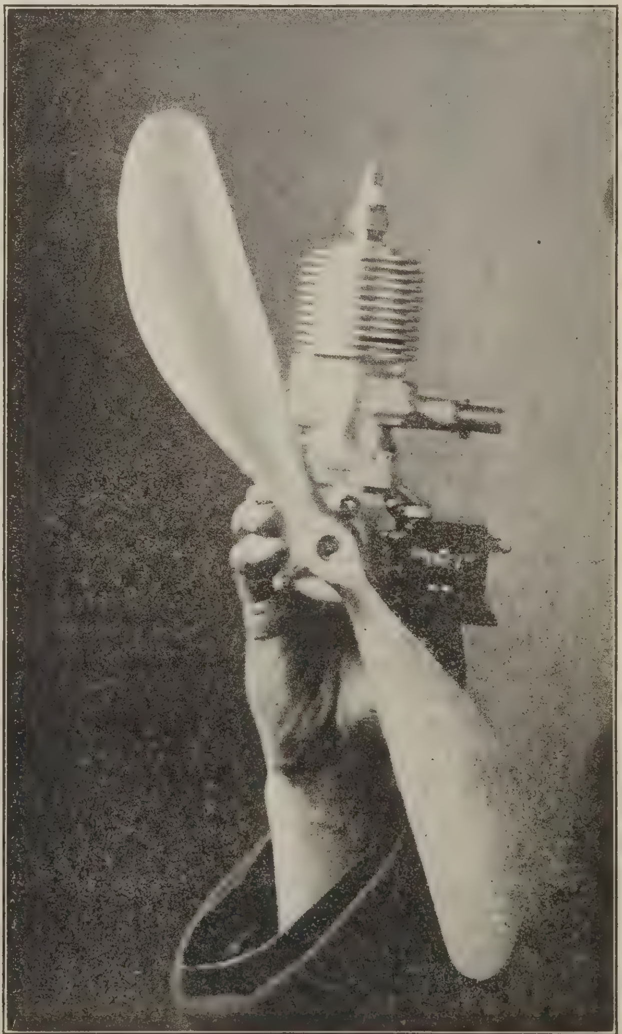
NO ENTRANCE FEES—Prizes being donated by the Ottens Real Estate Company of Wildwood.

IF AN ENTRANT HAS NOT HAD MORE THAN A YEAR'S EXPERIENCE IN MODEL FLYING A HANDICAP WILL BE GIVEN.

ENTRIES MUST BE IN NOT LATER THAN AUGUST 16th, but are requested to be sent immediately in order that the number of entries may be estimated in order to figure the number of prizes to be given.

SEND ENTRIES TO WM. J. HEWITT,
215 WINDSOR AVENUE, CAPE MAY, N. J.

KITE FLYING EVENTS:—Place of landing, speed in ascending, best decorated, most novel kites—prizes for all.



½ h.p. Midget Gasoline Motor

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials cf contributor will be printed when requested.

Aeroplane vs. Steam Roller

By Phil Rader, Instructor at Curtiss Aviation Field, Buffalo, N. Y.

It was a hot lazy morning. There was just a suggestion of a breeze that barely moved the red flags marking the bad spots on the aerodrome.

Far down the field stood the trusty steam roller. It towered majestically above the weeds, despite the fact that it had a pronounced list to starboard, owing to the fact she was stuck in the mud, and had been, for many days. Its rusty stack belched forth black smoke, and she hissed merrily from various leaks, for once again she was to try to pull loose from her too slippery anchorage.

At the other end of the field stood the aeroplane. It was of the latest military type, and reflected the blazing sun from her shimmering surfaces and her polished engine. A mechanic was turning the beautiful mahogany propeller. The sparkling engine started with a roar, raising a huge cloud of dust at the rear of the machine.

The steam roller, seemingly attracted by the noise, raised its rusty old head and belched forth defiance at its modern neighbor. "I can remember the day," said the Roller, "when people used to collect around me, and look at me in wonder and amazement. That was many years ago, when I was young and beautiful!" A look of jealousy seemed to cross the antique Roller's features. It gave the Roller the appearance of a tired old man, still strong, but worn out.

In the meantime, pilot Al Johnson had clambered into the aeroplane, and with a magnificent gesture signaled the mechanics to let go. Down the field he rushed, faster and faster until the aeroplane was on its tiptoes, and when almost abreast of the old Roller it rose lightly in the air. Higher and higher he mounted, until he was obscured by a cloud. The engine now sounded like the distant drone of a honey bee. Now the sound was lost altogether.

The Roller, watching this wonderful performance, ejected a huge snort of black smoke and cinders and hissed with rage. "Why should that beautiful, effeminate thing be able to soar through the clouds, while I wallow here in the mud on the ground!" The dew from the exhaust resembled huge tears. The old Roller's sides shook with the pressure of steam and emotion. "Come and meet me in mortal combat on the ground!" he shrieked. "I will put some dents in your shimmering sides, and make you into a tangled mass of wire, linen and wood! Oh! you may be able to mount into the clouds, but when it comes to strength and stamina I stand victor and defy you."

The purr of the aeroplane engine was audible once again. The plane came nearer and nearer to the earth. The swish of the wind could be heard through the wires. It would soon land. Near the earth the treacherous little breeze gently swung the tail of the aeroplane so that it was making a direct lines toward the old Roller, unbeknown to the pilot.

The Roller, perceiving this, grinned and bared its rusty old teeth, and muttered, "Now we shall see who is the best."

The aeroplane swooped along a few feet from the ground. The pilot had the grin that all pilots have when they are making a good landing. Nearer and nearer it came to the Roller. Pilot Johnson looked ahead to see if all was clear and saw the roller. He pulled back his elevator and tried to jump it. Nothing doing. They locked horns with a terrible crash! A cloud of steam and dust arose, and then cleared away. The aeroplane was on top of the roller with a broken propeller and other trifling damages. On the ground lay strewn the cast-iron parts of the Roller. The rusty stack listed worse than ever, and a huge gash in its side was letting its life blood ebb away. With a final gasp and sigh, the old Roller settled on its side, never to run again.

The aeroplane had won.

Mendicant—Sir, I have paralysis, six children to support, my wife is sick and we are about to be dispossessed!

Aviator—Piffle! Did you ever try to run a second-hand aeromotor?

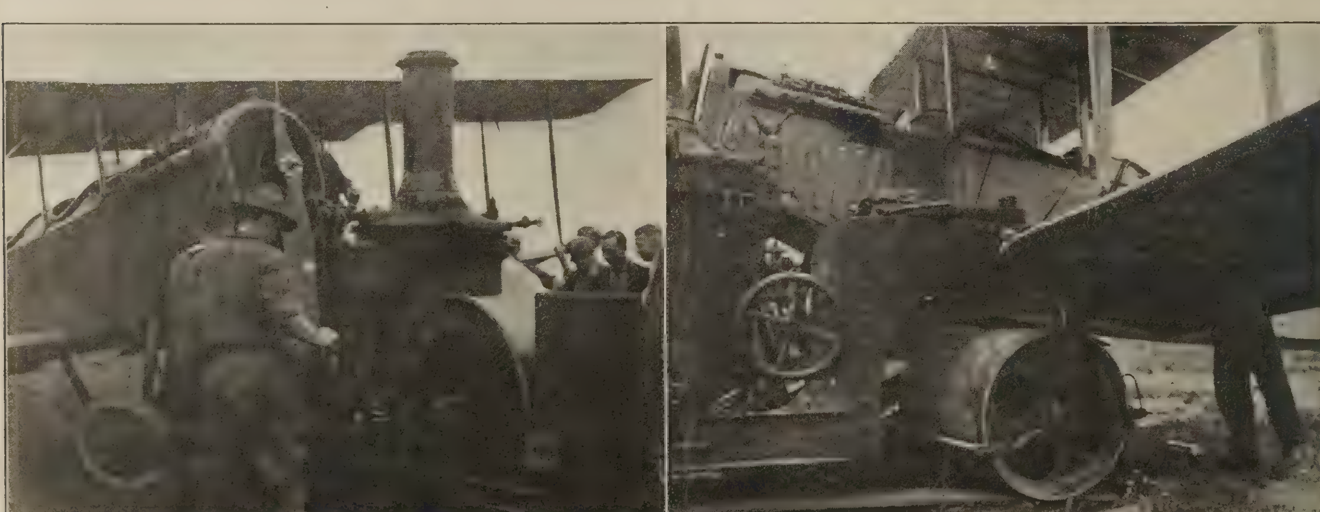
Modern Romance

"Will you marry me, my pretty maid?"

"How many cylinders has your aeroplane motor, sir?" she said.

"This second-hand motor broke down the third day after I bought it from you."

"Splendid! That's the best it's ever done."



Aeroplane vs. Steam Roller

(*Continued from page* 665)

and ϕ do not appear. Likewise, equations (1b) involve only the asymmetrical motion, lateral and directional, and do not contain θ, u, w, and q The two sets may then be considered separately, the former on integration giving the "symmetrical motion" and the latter the "asymmetrical motion."

Since $\frac{d\theta}{dt}=q$, equations (1a) may be written in terms of three variables u, w, and θ and their first derivatives. The "resistance derivatives" X_u, X_v, X_q, etc., are constant coefficients. The three variables are each functions of the time, and the three equations at any instant of time must be satisfied by a concordant set of values of u, w, and θ. The equations are, therefore, simultaneous and are linear differential equations with constant coefficients.

Writing the operator D to indicate differentiation with regard to time or $\frac{d}{dt}$,

$$\left.\begin{array}{r}(D-X_u)u-X_w w-(X_q D+g)\theta=0,\\ -Z_u u+(D-Z_w)w-(Z_q+U)D\theta=0,\\ -M_u u-M_w w+(K_B{}^2D^2-M_q D)\theta=0.\end{array}\right\} \qquad (2a)$$

The right-hand members of these equations are no longer zero if any wind gusts are assured. The complementary function may be found by the well-known "operational method" by algebraic solution for D. (See: Wilson's "Advanced Calculus," p. 223.)

The physical condition that the three equations shall be simultaneous is expressed mathematically by equating to zero the determinant Δ formed by the coefficients of the variables u, w, and θ. Thus:

$$\Delta=\begin{vmatrix} D+X_u, & -X_w, & -(X_q D+q) \\ -Z_u, & D-Z_w, & -(Z_q+U)D \\ -M_u, & -M_w, & (K_B^2 D^2-M_q D) \end{vmatrix}=0.$$

Expanding the determinant we obtain:

$$A_1D^4+B_1D^3+C_1D^2+D_1D+E_1=0,$$

where for abbreviation:

$$A_1=K_B^2,$$

$$B_1=-(M_q+X_u K_B^2+Z_w K_B^2),$$

$$C_1=\begin{vmatrix} Z_w, & U+Z_q \\ M_w, & M_q \end{vmatrix}+\begin{vmatrix} X_u, & X_q \\ M_w, & M_q \end{vmatrix}+K_B^2\begin{vmatrix} X_u, & X_w \\ Z_u, & Z_w \end{vmatrix}$$

$$D_1=-\begin{vmatrix} X_u, & X_w, & X_q \\ Z_u, & Z_w, & U+Z_q \\ M_u, & M_w, & M_q \end{vmatrix}-g\begin{vmatrix} M_u, & (-)\sin\theta_0 \\ M_w, & \cos\theta_0 \end{vmatrix},$$

$$E_1=-g\begin{vmatrix} X_u, & X_w, & \cos\theta_0 \\ Z_u, & Z_w, & \sin\theta_0 \\ M_u, & M_w, & 0 \end{vmatrix}.$$

The solution of the biquadratic Δ for D is of the form:

$$D=a,\ b,\ c,\ \text{or}\ d,$$

$$\theta=K_1e^{at}+K_2e^{bt}+K_3e^{ct}+K_4e^{dt},$$

where K_1, K_2, K_3, K_4, K_5, ... K_{12} are constants determined by initial conditions. Solutions for u and w are similar.

The condition for stability of motion is that θ, u, and w shall diminish as time goes on. Hence, each of the roots of the biquadratic must be negative if real, or, if imaginary, must have its real part negative. This condition for stability may be applied without finding the constants K_1 to K_{12}, by solving only the biquadratic for a, b, c, d. Indeed, Bryan has shown that by use of Routh's discriminant the biquadratic need not be solved. The condition that a biquadratic equation have negative real roots or imaginary roots with real parts negative, is that A_1, B_1, C_1, D_1, E_1 and $B_1C_1D_1-A_1D_1{}^2-B_1{}^2E_1$ be each positive.

In a similar manner the equations (1b) defining the asymmetric motion may be expressed as linear differential equations with constant coefficients.

Substitute $D^2\phi$ for $\frac{dp}{dt}$ and $D\phi$ for p. Then:

$$(D-Y_v)v+(U-Y_r)r+(g-Y_pD)\phi=0,$$

$$-L_v v-L_r r+(K_A^2D^2-L_pD)\phi=0,$$

$$-N_v v+(K_C^2D-N_r)r-N_pD\phi=0,$$

$$\Delta_2=A_2D^4+B_2D^3+C_2D^2+D_2D+E_2=0,$$

where:

$$A_2 = K_C^2 K_A^2,$$

$$B_2 = -Y_v K_C^2 K_A^2 - K_C^2 L_p - N_r K_A^2,$$

$$C_2 = -L_r N_p + N_r L_p + K_C^2 L_p Y_v + N_r Y_v K_A^2 + N_v U K_A^2 - (L_v Y_p K_C^2 + N_v Y_r K_A^2),$$

$$D_2 = Y_v(L_r N_p - N_r L_p) + L_v(U N_p + g K_C^2) - U L_p N_v + (N_v Y_r L_p - L_v Y_r N_p + L_v Y_p N_r - N_v Y_v L_r),$$

$$E_2 = g(N_v L_r - L_v N_r).$$

As before, the condition for stability is that the real roots and real parts of imaginary roots of the biquadratic be negative.

(*Continued from page* 666)

room. In this department a careful inspection is made by men trained in this work and amply provided with micrometer gauges and other accurate measuring devices to see that each part is within the close limits allowed by the specifications. Here, also, flaws in material or errors in workmanship are sure to be discovered. After passing the inspection department the parts are sent to the stock room, where each part has a space set aside for it. All the parts entering into a number of magnetos are brought together and are sent to the assembly department where the magneto is assembled complete.

Here again training and experience are essential, as the fit of the different parts must be accurate and the assembly done to assume smooth running and maximum efficiency.

From the stock room the assembled armature and all the other parts necessary to complete the magneto are sent to the assembly department where the final assembly is made.

When finally assembled, the magnetos go to the testing department for final test. Here the mounting dimensions, fit of removable parts and adjustments are checked, and then the magneto is set up and run at maximum speed for several hours. During this time it is watched for signs of unsatisfactory operation.

After completing the test run each Berling magneto is partially disassembled and carefully examined for any defects which may have appeared. It is then cleaned and reassembled, given a short run and sent to the ready stock room where a record of its serial number and other data is made, and thence to the shipping room.

(*Continued from page* 663)

inches piston displacement). These motors are for use in testing carburetors, ignition devices and other accessories.

The Laboratory is also well equipped with gages, pressure indicators, and equipment for calibrating apparatus. A Hospitalier-Carpentier manograph and other pressure indicating devices are included in the equipment.

Carburetor Tests

The same apparatus used for motor testing is used for conducting tests on carburetors.

Transmission Tests

By combination of certain pieces of apparatus mentioned above, exhaustive transmission tests can be made. The cradle dynamometer may be used to furnish and measure the input of power, while the power, output may be measured by an Alden brake or a second electric dynamometer. The mechanical efficiency of the transmission is, of course, equal to the output divided by the input.

It is important to note that no electrical measurements whatever are necessary where the electric cradle type of dynamometer is employed. This fact makes it possible to avoid those errors which are likely to enter into tests in which an ordinary electric motor with a questionable efficiency curve and only electrical measurements are relied upon.

Road Tests

The Club is also prepared to conduct tests of tires and other appliances or accessories where such tests are feasible. Special apparatus for determining fuel consumption of a car on the road is a part of the Laboratory's equipment.

Fitting A Motor for Test

Some machine-work may be necessary to adapt the motor to the testing block. This consists principally in fitting the flange of the dynamometer coupling to the flywheel. As much of the machine work as is possible should be done before shipping the motor to the Laboratory for test. Upon receipt of a description of the motor (or preferably assembled drawings showing the method of support and kind of flywheel) a detail drawing of the necessary changes will be furnished.

Although the Laboratory has facilities for doing machine work, a saving of time often results if this work is done before sending the motor to the Club for test.

A Correction

In the July 31 issue of AERIAL AGE, we stated in a news paragraph concerning a test of the Thomas aeromotor that the gasoline consumption was 14 gallons per hour. This should have read 12.5 gallons per hour.

(*Continued from page* 659)

in the oil system and should also indicate that the flow of oil is undisturbed.

GASOLINE GAUGE.

Gasoline gauges should indicate the amount of gasoline available in the main tanks, and should not depend on the visibility of gasoline in a glass tube, as, due to the transparency of gasoline, a full tank and an empty tank would give the same indications. Mechanical indicators are considered preferable.

GASOLINE-FLOW INDICATOR.

Gasoline-flow indicators should depend on mechanical means of indicating that the gasoline is being supplied from the main tanks to the service tanks.

DISTANCE INDICATOR.

For navigation at sea or over unknown country, it is desirable that a record of distance flown through the air should be available. If it were not for the fact that the slip of the propeller depends largely on the load of the machine, and whether or not the machine is climbing or gliding, an engine counter would serve this purpose, but it is considered preferable to have a counter or recorder actuated by an anemometer for this purpose. In either case, actual distance over the surface will require correction for the wind velocity and direction.

BAROGRAPH.

Barographs are subject to the same general specifications as altimeters.

ANGLE OF ATTACK INDICATOR.

An angle of attack indicator should be dead beat, free from the effects of gravitation, and accurately respond to and indicate any change of the direction and flow of air to the supporting surfaces. It should be light, rugged, and its indications should be clearly legible to the pilot. It should be designed for attachment in advance of the wings on a tractor biplane and clear of the influence of the propeller or the fuselage.

RADIATOR TEMPERATURE INDICATOR.

A radiator temperature indicator should be readily inserted in the top of the radiator and should clearly indicate the best operating temperatures. The thermometeer should conform to best practice, and the entire instrument be sufficiently rugged to withstand reasonable vibration and shock.

GASOLINE FEED SYSTEM PRESSURE INDICATOR.

Where the gasoline feed is not gravitational, the indications of the pressure available must be accurate. The gasoline feed system pressure indicator must not be affected by vibration or change of temperature. It must have a good scale and a dead-beat action.

SEXTANT.

Sextants should be as light and small as possible commensurate with proper accuracy. A sextant for measuring the altitude of a heavenly body above a horizontal plane without the use of the sea horizon or an artificial horizon would be most desirable.

AEROPLANE DIRECTOR.

An aeroplane director for the mechanical solution of the course and distance made good, based on the course and speed of the aeroplane and the force and direction of the wind, is a desirable development.

AERIAL AGE WEEKLY

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VOL. III NEW YORK, AUGUST 21, 1916 No. 23

Army Preparing to Train Hundreds of National Guardsmen

THE Committee of the Aero Club of America which has just returned from a conference with the War Department regarding the plans to develop our aerial defenses, for which Congress has allowed $13,281,666, is reporting to the Executive Committee that the War Department is ready to train hundreds of National Guardsmen.

Mr. Alan R. Hawley, president of the Club, who attended the conference with Messrs. Henry Woodhouse and Augustus Post, gave the following interview today regarding the plan to train the National Guardsmen. Mr. Hawley said:

"Congress made appropriations for the organizing of twelve aero squadrons for the twelve Militia divisions, the sum of $800,000 being allowed for each aero squadron. The War Department is anxious to assist the militia in every way possible, and Lieut.-Col. George O. Squier, commanding officer of the Aeronautic Section of the Army, is coordinating all the resources at his disposal to facilitate the training of the hundreds of National Guardsmen from different States who are anxious to learn to fly.

"To get aviation training at the Army aviation schools, the guardsmen must apply to the Department of Militia Affairs at Washington through their Adjutant Generals, who will send the applications to the Department of Militia Affairs with their endorsement. The Department will then give prompt consideration to the application, and if the candidate passes the physical examinations prescribed by the Army for aviation service, the candidates will be sent to one of the Army aviation schools. Aviation mechanics and assistants will make application the same way and will be sent to aeroplane factories to get experience with aeroplanes and motors. After the National Guardsmen have learned to fly, they can go back to their States and form aero companies and get the aeroplanes and equipment from the War Department."

The Aero Club authorities expect that there will be many applications, as the Club has been literally flooded with applications from volunteers, most of whom are men of exceptional class and experience. The Adjutant Generals of the Militia of different States are finding that whereas it is often difficult to get recruits to fill the regiments of other branches of the service, there is an abundance of volunteers for the air service. For instance, New York has already supplied the personnel for two aero companies which were organized at private expense, and about fifty college men are learning to fly to join the Aerial Reserve Corps. Adjutant General Foster, of the Florida Militia, recently sent the Club a list of 133 volunteers for the air service; Adjutant General Hall, of Nebraska, has submitted enough personnel for two aero companies. Kansas City, Mo.; San Antonio, Texas; Chicago, San Francisco, Los Angeles, Detroit, St. Louis and the States of Iowa and Vermont are among the cities and States which have organized or are organizing aero companies and aero squadrons.

The Wright-Martin Aircraft Corporation and the Hispano Suiza Motor

THE American aeronautical movement has been waiting with much expectation detailed reports regarding the 150-horsepower Hispano-Suiza motor being constructed at the Simplex plant at New Brunswick, N. J. These details and photographs will be published in a short time.

The Wright-Martin Aircraft Corporation has the North American rights for the manufacture of this remarkable motor, which weighs but 363 pounds, or at the rate of 2.42 pounds of weight per horsepower, and develops 150 horsepower at propeller speed.

This Hispano-Suiza motor is the result of many years of experimentation by a French company under the direction of M. Birkigt and is unique in construction in that it does not follow the general plans of any other aeroplane motor. Before its adoption by the French Government as the standard, it was tried out for several months under the most severe engineering and military tests in all kinds of weather and passed most successfully.

The original order for these motors placed by the French Government called for *fifty motors,* but within sixty days the order was increased to 1,800, because the absolute superiority of the motor was established. There are no German aeroplane motors that can approach the Hispano-Suiza in lightness, reliability, flexibility and lasting power.

How the rights to manufacture this motor for North America were acquired by the Wright company is interesting. Henry Lockhart, Jr., and Henry M. Crane, chairman of the board and chief engineer, respectively, of the Simplex Automobile Co., which builds the highest grade and highest priced automobile engines in this country, went to France last November in the interest of the Wright company, which had previously acquired an interest in the Simplex company, to make a study of aeroplane motors. This trip was arranged by Prince Poniatowski, who has been most active in aeronautics since the war began. Prince Poniatowski is at the head of the Societe Auxilaire pour l'Amerique au Nord, the European representatives of the Wright company.

Every facility for investigation was placed at their disposal by the French Government. They were permitted to visit all the Government plants and aeroplane stations,, and more particularly the famous testing field and shops at Chalais Meudon, where no other outsiders perhaps have ever been permitted entrance since the war commenced.

At this testing ground every type or aeroplane motor manufactured in the world was being tested and experimented with. Thus the American representatives had an opportunity to study first hand the French Government tests of all makes of aeroplane motors, including captured German motors. Among all these motors the Hispano-Suiza stood out pre-eminent.

It was with a great deal of hesitation that the French Government consented to turn the plans and specifications of and the right to manufacture their choicest motor over to the Wright company, and one of the most important considerations imposed was that the Wright company should obligate itself to manufacture these motors for France and Russia. England has purchased the right to manufacture this motor in Great Britain and Russia for its manufacture in Russia.

It was this motor that permitted the French to regain command of the air after losing control for a few months upon the appearance of the speedy German Fokkers. The nation with the speediest aeroplanes controls the air and the Fokkers for a few months held that control.

It is interesting in this connection, however, to note that the German Fokker is a monoplane of French design pirated by the Germans after the commencement of the war. It is the old French Moran-Saunier monoplane with the front slightly changed, but with either a Mercedes or Daimler engine installed of approximately 135 horsepower and a speed of 115 miles. The present French machines have 150 horsepower Hispano-Suiza motors and a speed of between 120 and 125 miles per hour and are the fastest machines operating on any of the various war fronts.

As evidence of the hearty co-operation of the French Government in successful production of the Hispano-Suiza motor in this country, the French Government sent over a corps of experts to assist in the construction and equipment of the new Simplex plant at New Brunswick and to superintend the manufacture of the first installment of motors. These experts included designers, machinists, metallurgists, chemists, engineers, draftsmen, and even special machinery was sent over and installed.

Undoubtedly no other plant in the country is better equipped than the Simplex Automobile Co. to undertake the manufacture of this French motor. For years the Simplex plant has been making the highest priced and highest grade automobile motors. These have been equal to the best produced abroad where the science of motor construction has led anything, with but one or two exceptions, produced in this country.

The new Simplex plant at New Brunswick will be one of the largest aeroplane motor factories in the world. Several million dollars has been expended on new construction and for new machinery. The Wright-Martin Corporation also expects to build a large aeroplane plant near New York, where planes will be manufactured, and the aeroplanes assembled and tested.

The new Hispano-Suiza turned out at the New Brunswick plant have been thoroughly tested and proved to be equal in every respect to the French make. First shipments will be made in a few days. The initial order from foreign governments totaled 450 motors, but this will be largely increased. The demand from abroad will be for all that can be produced as long as the war lasts and perhaps beyond that.

In addition to the acquisition of the Glenn L. Martin plants at Los Angeles, which will probably be moved East or retained,, and a new plant built in the East, and the Simplex plants at New Brunswick, the Wright Corporation controls the General Aeronautic Co. of America, which handles the foreign business of the Wright company and also owns the Wright Flying Field, Inc., at Hempstead, Long Island. At this field the United States Government has fifteen hangars. This will undoubtedly become the center of aviation in this country for the testing out of machines and the training of aviators.

The Aero Taximeter

MR. ALAN R. HAWLEY, president of the Aero Club of America, has suggested a new form of recording barograph to be used by students in aviation for making an accurate record of what takes place in the air from the time they leave the ground to the time they make a landing. This record will show the exact time that they were in the air, the exact altitude at every moment of their flight and will give a visual record of their steadiness of flying and every maneuver that is made showing the skill with which the student operates the controls. This instrument consists of an ordinary barograph or recording barometer so arranged that the recording cylinder will run at a much higher speed than the ordinary barograph, making one revolution in an hour instead of one revolution in twelve hours. The markings on the chart of this cylinder will be correspondingly enlarged in proportion to the change in the speed of the revolving cylinder. This will magnify the ordinary barograph record twelve times, and it will be limited in recording the height to about 1,500 feet—half the height which the ordinary barograph chart records, thus making the variations in altitude twice as large. By a study of the charts made by this barograph the teacher will be able to show the pupil the exact points wherein he can improve his flying, and a record of the progress of the pupil will be shown by a comparison of these records.

Aeroplanes in Peace and War

EVERY day we hear much about the work of aeroplanes and daring aviators in the war. All this is quite interesting, sometimes thrilling, and we all know that the flying machines have been useful on the battle fronts; but there are many who would prefer to hear about useful aerial achievements of a peaceful character, indicating a growing utilization of the aeroplane in trade and transportation.

Evidence of such utilization in a new way came to light a few days ago in the answers of the president of a company that makes aeroplanes to the questions of a friend who could not see that the field of the flying machine's peaceful work was becoming broader. A banker interested in a mine made almost inaccessible by mountains that surround it has decided that aeroplanes must be used there to solve the transportation problem. With his mind's eye he sees the air wagons carrying workmen, tools, and supplies to the mine and carting away the valuable ore. And he has asked the company to give him price estimates for ten machines, each of them able to carry three tons of freight. It is said that the price for ten will be $600,000. We may add that on the day when this project was disclosed an aviator made a flight from Buffalo to Hammondsport, 110 miles, in sixty-four minutes, and that his biplane was a freight carrier, its load or cargo being a propeller to be placed in a flying machine which a company is building at Hammondsport for the United States Army.

On the other hand, let us look at the same day's war reports. There were stories about engagements, over the Somme battlefields, of flotillas of aeroplanes, a dozen on each side, and we were told that a British "brigade" of machines had dropped 112-pound bombs on a town within the German lines. Much of the fighting in France was done at an elevation of 9,000 feet. And at about the same height, above the Gulf of Trieste and the Adriatic, an Italian aeroplane was wrecked and burned. A "squadron" of German fliers over the French front dropped bombs near the King of Montenegro. In connection with this comparatively respectable and decent warfare the same day's foul work of Zeppelins that killed two women and three children on the British east coast scarcely deserves to be mentioned.

May the day soon come when the energy, skill, and courage exhibited by aviators in the war shall be free to promote and develop useful employment of aeroplanes in the arts and industries of peace!—*New York Times.*

French Prisoner of War (to German Guard): "The air in France is better than it is in your country."

German Guard: "Well, you see, our airmen clean it regularly every day."—*New York Evening Post.*

International Air Laws

(Editorial Buffalo *Evening News*)

Undeterred by the fact that the European nations have played pitch and toss with international law, the Pan-American conference, which recently held meetings at Santiago, has been busy formulating new international air laws.

The first draft of these air bills which the conference has resolved to recommend to all countries has been received by the Aero Club of America, and makes interesting reading.

The first bill provides that all space above the earth too high to be utilized by the proprietor of the ground beneath shall be declared public property.

That is what might be called a regular blue sky law and will be appreciated as such by the man who has to shake the baby's bank for car fare.

But the framers of these air laws are imperial thinkers, as the following summary of their efforts in aero legislation proves.

These bills provide that all nations shall have a sovereign right to the space dominated by their territories, and that private aeroplanes belonging to the citizens and the legal residents of a country shall have a right of passage through the space over other nations.

Every airship, aeroplane or other aircraft, shall have a nationality—public airships shall have the nationality of the nation to which they belong, and private machines the nationality of the individual owning them.

It is also provided that all aircraft shall carry distinctive badges of nationality after they have been registered.

The nations shall endeavor—we like that word in this connection—when there is aerial warfare not to harm neutral nations and endeavor not to restrict the commerce of neutral countries.

Aeroplanes shall be employed by the Red Cross for errands of mercy.

These laws are, of course, only tentative proposals. But they are meant seriously by the promoters of these laws and it is intended to convene a congress to further discuss them and adopt a universal code, also, incidentally, to stimulate and facilitate aerial locomotion.

The Eagle's Nest

I stopped one night in Hammondsport. There lay
 A spell upon the valley; Sleep knelt down
 And kissed the steeples of the little town;
Spare Quiet stalked the roads in his cloak of gray—
And yet what roar was that? What light like day
 Droned forth upon the hill? What demon's frown
 Beat through the dark round where in a blazing crown
The Curtiss shops crashed in grim roundelay!
All night the eagles in their fiery nest
 Strained forward, poised for flight in lands far off
 And cities yet unknown to Yankee breath,
Where beaked with flame, and thunder-hot in the quest
Of battles, up from the rolling hosts of Romanoff
 They rise upon the roaring wings of death!

EARL SIMONSON in N. Y. *Tribune.*

THE NEWS OF THE WEEK

Rapid Express Service

A message was received from Hammondsport by the Curtiss Co. in Buffalo on the afternoon of August 8th that a Navy hydroaeroplane was ready for testing there, but that a new-design propeller which had been just built at Buffalo was needed. As the trials were necessary to be held without delay and the train service between Buffalo and Hammondsport is such that the tests would have to be postponed, a Model "R 5" experimental military machine of 160 horsepower was requisitioned to carry the needed blade.

Lashing it in the front cockpit, Pilot Victor Carlstrom left the aviation field at Buffalo at 3:32 P. M., arriving over Hammondsport at 4:34, or 1 hour and 2 minutes later. The railroad distance is 119 miles, and as this course was generally followed, remarkably fast time was made. A favorable wind aided in the flight, although a rainstorm was encountered toward Hammondsport.

The hydro test was made, and the following morning Carlstrom returned to Buffalo in the same machine. The return trip took 1 hour and 40 minutes, all of which was against a strong, nearly direct head wind.

Aviation Racer Sets New Mark for 300-Inch Cars at Indianapolis

The Packard aeroplane twelve exceeded the Speedway record at Indianapolis, August 4th, by ½ second. This is the first time that a lap of the 2½-mile track has been made by a 300-inch motor at more than 100 m.p.h. The unofficial time was 1 minute 29.32 seconds. The best previous time for a motor under 300 cubic inches was that of Boillot in a Peugeot, 1 minute, 30.13 seconds, in 1914.

This is the same car that J. G. Vincent, vice-president of engineering of the Packard company, had at New York during April and May this year, with the exception that a new intake header had been added for better performance at high speeds. The car was driven by Rader, who carried a mechanic and 10 gallons of gasoline. This is the first of a series of tests which are to be made by the engineering department to demonstrate the efficiency of the small bore twelve. Mr. Vincent states that the twelve-cylinder engine was of great advantage at Indianapolis, as the steady torque made the car hold the turns at the high speed.

Shaw Aeroplane Co. Using Sturtevant Motors

The Shaw Aeroplane Co., of Indianapolis, has asked us to correct the general impression that they are using Johnson motors in their aeroplanes. Sturtevant motors are used exclusively. We hope to present to our readers in the near future a complete description of the latest Shaw aeroplane.

Standard Aero Mfg. Co. to Enlarge Plainfield Plant

Plans have been prepared for the construction of a 1-story, 65 x 165-foot addition to the plant of the Standard Aero Mfg. Corporation. Estimated cost, $80,000.

Military Aviation

Four fliers of the North Island army aviation school have completed their cross country flights that are included in their examinations for rank as junior military aviators. The group consists of Lieutenants G. E. Reinburg, S. H. Wheeler, G. H. Brett, and J. C. McDonnell. The flights were made without mishap. The officers are to be sent to the Texas border when they acquire junior military aviator rank.

Export of Aeroplanes

Exports of aeroplanes and parts, for the week of August 6th, were as follows: To England, $43,956, to Scotland, $4,300, total, $48,256.

Shaw Aeroplane and Motor Company Organized

The Shaw Aeroplane Company, of Indianapolis, has been succeeded by the Shaw Aeroplane and Motor Company. The officers are as follows: B. R. Shaw, president; F. G. Cathrall, vice-president; W. M. Cathrall, treasurer, and B. L. Shaw, secretary.

Bureau of Standards Works to Improve Spark Plugs

The Pittsburgh branch of the Bureau of Standards has carried out a series of experiments with porcelain suitable for spark plug manufacture. The investigations on this type of porcelains have been of a preliminary nature in attempts to utilize deposits of California steatites in the production of sparkplugs equal in quality or superior to the French and German steatite sparkplug imported into this country. The tests have pertained mainly to the composition and method of manufacture of the plugs and have not proceeded far enough to include actual service tests. In this connection the Bureau of Standards has been in co-operation with several manufacturers of spark plugs in an endeavor to improve their product.

Curtiss Machines in Denmark

Word has just been received that Lieutenant Laua, of the Danish Flying Corps, has broken the distance record for Denmark, using a Curtiss 90-horsepower motor. His continuous flight covered 700 kilometers, or about 435 miles.

Officers and men of the Aviation Section of the Second Battalion, Naval Militia, New York, at their encampment at Bayshore, L. I. Ensign Vincent Astor is sitting, third from the left.

Burgess News

Extensive experiments with wireless from aeroplanes have been begun by the Burgess Company. The lightest apparatus ever devised for radial work has been installed on a Burgess-Dunne machine for carrying out the tests.

The device includes a generator, sending and receiving outfits and trailing atennae. Two Harvard young men, operating under the firm name of Cutting & Washington, are the originators of the system which they designed especially for use in aviation.

The great difficulty with wireless from an aeroplane comes in receiving on account of the almost deafening sounds of the motor while the machine is in flight. This makes useless the ordinary methods of detecting the dots and dashes which make up the telegraphic code. The inventors of the system above mentioned, however, have worked out a special device to overcome this handicap. The radio operator in the machine wears a brass helmet, which is designed to be as nearly as possible soundproof. It completely covers the head and rests on his shoulders. With this is a telephonic receiver something like that customarily used in wireless work.

The sending presents no especial difficulty, as the receiving station suffers no such interference from noise as is the case with the aeroplane.

A number of new pupils recently enrolled with the Burgess Company. Among them may be mentioned Gordon Prince, of Beverly Farms, Mass. He is a cousin of Norman Prince, who has made such a name for himself by his work with the French aviation forces on the war front in France. Another pupil of note is Ector Orr Munn, of Boston, who is taking up aviation as a sport.

A prominent officer of the Chinese army who does not wish his name known is another recruit. After an extensive examination of various aeronautical plants through the country, he has come to Marblehead to get the practical training required by a military pilot.

All three of those mentioned are taking a course of training in the Burgess-Dunne.

Miss Lyra Brown Nickerson Engaged

The hobby of Miss Lyra Brown Nickerson, of Providence, heiress to a six or eight-million-dollar estate, who has just announced her engagement to Henry Garfield Clark, assistant director of athletics at Brown, is preparedness.

Specifically, her hobby is preparedness in the air.

Miss Nickerson's aerial preparedness hobby is not merely a hobby. She put it to practical effect by her gift of an aeroplane to the aviation section of the Rhode Island National Guard.

Vernon Castle Dances Between Flights

A prominent New York theatrical manager has recently received a letter from Vernon Castle, the well-known dancer who is with the R. F. C. at the front in France.

"It's not at all bad here," wrote the dancer and comedian, "except we have to fly over the German lines every day and get shot at by their guns. Up to now I am perfectly safe and well, but some day they may not know who I am and accidently hit me. I'm flying a monoplane that looks something like a Fokker.

"In the evening I give dancing lessons to the officers, so that after the war if you want a perfectly good male chorus I've got one ready for you. I don't know how long this war will last, but I hope I don't have to play this part for more than a season unless they star me.

"Please send me some music from your latest productions. The latest they have here is 'The Robert E. Lee.'"

Carburetor Manufacturer Expands

Plans for greatly increasing both the manufacturing and distributing facilities for Browne and Browne-Branford Carburetors have culminated in a recapitalization of the Holt-Welles Co., Inc., sole selling agents for the Browne products, an increase from $50,000 to $200,000 in capital having been authorized.

This will provide the company with the necessary capital to expand in both distributing and manufacturing activities, and make production proportionate with the constantly increasing demand for both the Browne and Browne-Branford carburetors.

Mr. E. H. Stickels will remain president of the Holt-Welles Company, with the sales work under his direct supervision. Mr. Arthur B. Browne, designer of the carburetor and consulting engineer for the Malleable Iron Fittings Co., where the Browne Carburetors are manufactured, will have entire charge of the laboratory and experimental work. Mr. Paul Welles will be secretary, Mr. Calvert Holt, treasurer, while Mr. W. M. Williams has been appointed assistant secretary and treasurer of the company. Mr. Henry Soeldner has been engaged as production manager and took up his new duties about July 5th.

Kinloch Park to Be Plowed

The Kinloch Park aviation grounds, where the Aero Club of St. Louis in 1910 held a famous meet at which Col. Theodore Roosevelt rose as a passenger in an aeroplane, driven by Walter Brookins, are to be used for some of the plowing, seeding, discing and other demonstrations with tractors at next week's tractor show, according to announcement last night by Hugo Mueller, assistant manager of grounds.

Mueller said that all of the aviation field that is plowable will be plowed.

Equipment of the Business Men's Aviation Camp at Governor's Island, N. Y.—two Curtiss J.N. tractors. The third machine, a Sturtevant battleplane, was in the air when the picture was taken. Seth Low, Jr., and P. J. Bjorklund are preparing for a flight

Mrs. McKey Bryant Offered Services to Guard for Mexican Service

When we stated in our issue of July 24th that Miss Ybur Osborne, of San Francisco, was the first girl in the United States to offer her services as an aeroplane pilot to the army officials, we were incorrect by several days, for on June 29th Mrs. Alys McKey Bryant, who has made aviation history in the West and Northwest during the last four years and who is known as "The California Aviatrice," sent General Harvey, of the National Guard of the District of Columbia, an earnest plea to be permitted to do aviation scout work for the District National Guard on the border or in Mexico.

Mrs. Bryant flew for several years with her husband, who was finally killed in a fall in Victoria, British Columbia, in 1913. Mrs. Bryant continued flying and is wholly fearless. She has never had an accident, she says, and considers herself mistress of her machines. If given a 160-horsepower military tractor, she declares she will go anywhere ordered with confidence. She has been living for several months in Cherrydale, Va., with her brother, Lieutenant McKey, of the Third Infantry, D. C. N. G.

Chicago News

By A. E. Neaky

Activities have been steadily increasing at the Ashburn Flying Field and will probably continue to do so until the early part of September when a majority of the "boys" will be out on the road. Mr. Charles Arens of the Illinois Model Aero Club has recently completed a tractor biplane of his own design and the machine is now upon the field. It was given its initial trials by Mr. Laird, and showed to the best advantage, leaping off the ground in a very short distance and flying steadily. The tractor is powered with a 35 Anzani.

Miss Majorie Stinson and her brother Mr. Eddie Stinson are now on the field with three machines, two Wrights and a tractor biplane. Mr. Stinson has been flying the biplane steadily upon every opportunity and has shown the Ashburn contingent that he is destined to become as great a master as his well-known sisters. Mr. Stinson's tractor is of a very strong and speedy design, powered with a "fifty" Gnome. The machine was designed and built partly under the supervision of Mr. Walter L. Brock, consulting engineer of the Aero Club of Illinois.

Mr. Weiner has been flying regularly in his Curtiss biplane pusher. Mr. Laird, designer and flyer, has been doing much passenger-carrying in his exhibition tractor.

A series of foundation blocks have been layed and a contract let for the drilling of a well upon the new field. In a short time there will be more hangars and better facilities at Ashburn.

Mr. Ellis Cook of the Illinois Model Aero Club has left to take up a position with the Wright Company at Dayton, Ohio. Mr. Thomas Hall, also of the Model club, has secured a foreman's position with a Chicago aviation concern.

The United States Central Aviation Reserve has secured quarters upon the Commodore, the training ship of the Illinois Naval Reserve.

Mrs. Alys McKey Bryant, who offered her services to the Militia of the District of Columbia, in connection with the Mexican campaign

Stutz Car Aids Aero Squad at Monterey

The work of the aero squad in manœuver at Monterey, Cal., last month was greatly facilitated by having as part of the complement a Stutz touring car placed at the corps' disposal by Walter M. Brown, the Los Angeles dealer. Brown intended originally to be identified with the squad, but business obligations prevented his attendance, so he delegated Billy Taylor, the celebrated racing driver and a Stutz car salesman, to take his place, paying his expenses and salary.

Taylor says the automobile was of great value to the squad in many ways. Occasionally it was necessary for the car to rush at top speed across the rough fields when an amateur pilot had been unable to make the regular landing. At other times, the aviator would become lost to the observers, and the Stutz was detailed to scout over the surrounding country, locate the machine and bring the student back to camp. Taylor is a licensed aviator, and not infrequently he sent the automobile back in the hands of students and himself returned with the air craft.

The Sturtevant Model S3 seaplane being used for instruction purposes by the Rhode Island Naval Militia. It is powered with a 140 H.P., eight-cylinder Sturtevant motor

Pacific Aero Products Co. Busy

Among the most enthusiastic members enrolled in the newly established aviation school now being conducted by the Pacific Aero Products Company at the Lake Union testing and trial grounds, at Seattle, is a young Chinese, T. Wong, a graduate of Harvard University, who, in addition to cherishing the ambition to become a proficient birdman, is a mechanical engineer and draughtsman.

Aviator W. K. Martin, chief instructor in the flying department of the Pacific Aero Products Company, says Wong is an adept and daring pupil. In many flights recently made over the city, Martin's companion has been the young Chinese.

The aviation school conducted by the Pacific Aero Products Company is the result of the hobby of William E. Boeing, of Seattle, who has made aviation a study as well as a hobby for a number of years. Some time ago he decided that aviation had progressed to such an extent that it promised eventually to become a big factor in the transportation problem of the country. His idea brought about the organization of this company, the first enterprise of the kind on the Pacific Coast. When the company was incorporated recently, Mr. Boeing insisted upon the inclusion of the aviation school feature in the articles covering the objects of the new organization.

Aviator Martin, a graduate of the Wright school, was then engaged as chief instructor as well as the active conductor of all experiments with the new aeroplanes being constructed by the company.

This school of aviation instruction is being conducted strictly for the benefit of bona fide students, and a regular schedule of flights is followed. At present five days a week are devoted to flying, while one day is given over to mechanical construction during which the students are introduced into the technical branch of the course embracing the assembling as well as the manufacturing of the different machines.

Ashburn Aviation Activities

Since the hangars have been erected on the new Aero Club of Illinois flying field, at Ashburn, and the Chicago fliers have returned from their July 4th exhibition dates, great activity has been shown. Saturday, July 29th, was the biggest day for flying that Chicago has seen for some time. There was an aeroplane up somewhere practically all afternoon; several times there were two in the air at once, and for a while there were three. Laird was out looping the loop and carrying passengers. Miss Marjorie Stinson was out flying the school machine, and Edward Stinson was looping the loop on his new tractor biplane. This is a fast little machine designed and built by Walter L. Brock along European lines. It is powered with a 50-horsepower Gnome motor. Elmer L. Partridge was doing school work all afternoon until he was overcome by the great heat of the day and the exhaust of his motor while about 100 feet in the air and got into a bad spiral which ended in a smash. Partridge received only a scalp wound, but the student who was in the front seat got a broken leg. The machine was badly wrecked, but Partridge announced that he would resume school work in a few weeks with a new machine, with a 120-horsepower, 6-cylinder Hoyt aeroplane motor.

Miss Marjorie Stinson has been making daily instruction flights in her improved Wright type biplane, training a new class of Canadian students. Spectacular flights are made daily by Matty Laird and Edward Stinson in their tractors, built especially for looping and exhibition flying.

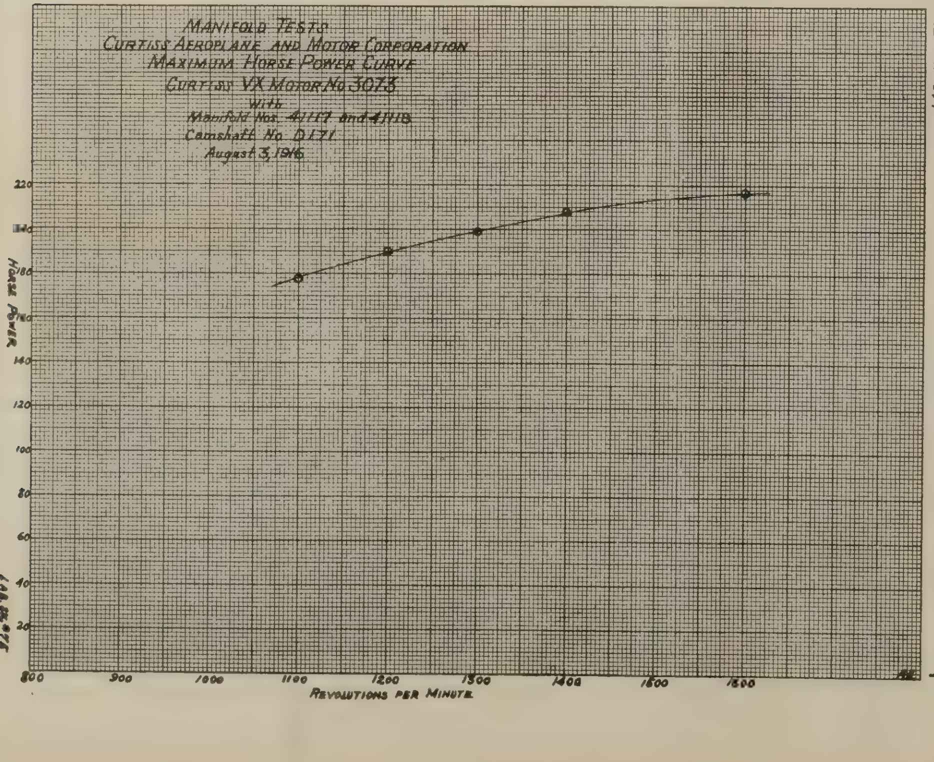
Edward Stinson's is a little faster than Laird's, but Laird can leave the ground in a calm in a distance which has been measured at 51 feet and climb at a remarkable angle. It carries a passenger with ease and handles well with the extra weight in spite of the fact that it has a span of but 26 feet and a motor of only 45 horsepower. Laird took Miss Marjorie Stinson up for a loop several days ago and had no trouble at all in getting over nicely. Miss Stinson enjoyed it immensely.

Recently Laird tried out a new little tractor biplane that he built to fly with a motorcycle motor. It would rise from the ground in a very short distance, climbing well and balancing nicely, but imperfect cooling limited the length of the flight. Charles Avens, a member of the Illinois Model Aero Club and former model aeroplane builder, recently brought out a very neat appearing and well-built tractor equipped with a 3-cylinder Angani motor. Laird tried it out and it flew well, showing plenty of reserve power for climbing, but extended flights were not made on account of the uncomfortable position of the pilot. Avens is about a foot taller than Laird and he arranged the controls in his machine to suit his reach. Tavas Weiner has been practicing daily in a copy of the little biplane so successfully flown by Lincoln Beachey two years ago. He handles it nicely and will soon take it into a loop, preparatory to his exhibition trip this fall. With fourteen machines on the field and more coming out every week, with two aviation schools in active instruction work, and daily exhibitions of looping the loop and stunt flying, Ashburn can easily be considered the most active flying field in America.

Art Smith Returns from Japan

Wearing 29 medals and a crutch, Art Smith, the boy aviator, who thrilled thousands of visitors during the Panama-Pacific exposition, has returned from Japan, where he has been flying for six months and where he sustained his present injuries.

Smith comes back with his right leg in a plaster cast and $9000 presented to him as a sympathy fund by enthusiastic spectators of his various flights. Twenty-two of his 29 medals were presented to him by various societies in Japan. One, studded with 32 diamonds, is the gift of the National Aero Society of Japan, awarded him for a flight at Tokio against a wind of 32 meters a second.



To meet the requirements of the British Admiralty, the Curtiss 160 H.P., Model "XV" motor has been slightly remodeled to run at slower speeds

The motor was designed to run at 1,400 to 1,500 revolutions per minute, at which speed it developed about 200 H.P. With some changes in the cam shaft, manifolds and timing, the power is secured at a much slower speed

The accompanying power curve shows 200 H.P. at 1,300 r.p.m., and 177 H.P. at 1100 r.p.m.

members which are readily accessible for adjustment, and for all control leads. Structural tension members shall be of hard cable, and control leads shall be of flexible cable. Cable terminals shall be wrapped and soldered. Spiral wire clips, without solder, shall be used for terminals of hard single-strand wire. No spliced terminals in hard cable will be accepted.

All cables which are members of the wing structure and normally under tensile load in flight shall be in duplicate, and made independent between fittings.

Satisfactory provisions shall be made, as far as practicable, for convenient and thorough inspection of control cables and pulleys and vital structural members.

In the internal wing bracing the compression members carrying the drag of the wings shall be separate wooden struts and *not* wing ribs.

Rib webs shall be reinforced between lightening holes to strengthen them in longitudinal shear.

(21) *Tipping propellers.*—The material and method of tipping propellers shall be such as to insure protection against the action of sand, as well as to render the tips secure in place.

(22) *Assembly, disassembly, and packing.*—The provisions for rapid assemblying and disassembling and for packing in crates of convenient size and shape for transportation shall be satisfactory. Detachable bolts, fittings, and other parts shall be as few in number and as simple as is consistent with other requirements.

IV. TESTS

Any or all of the following rules governing the method of conducting performance tests may be enforced at the discretion of the inspectors:

(1) Any or all machines must pass any or all tests to demonstrate guaranteed performances, and to demonstrate that all provisions of this specification have been complied with.

(2) All tests shall be started at approximately sea level.

(3) For all tests the power plant and aeroplane shall be identical in every detail with the arrangement it is proposed to use in practical service.

(4) The same type propeller, the factor of safety of which is satisfactory, shall be used for all tests.

(5) The motor shall not be driven during any performance test at a speed greater than 1,400 revolutions per minute (does not apply to other than Curtiss OX-2).

(6) The gasoline used shall be standard automobile gasoline testing not higher than 65° Baumé.

(7) The number of officially observed attempts for each performance shall be decided upon by the inspectors at the time of the tests.

(8) Before arriving at the starting point for each of the speed tests, machines must be flown at a height of not more than 25 feet for a distance of not less than 900 feet. The original altitude must be maintained over the specified course from start to finish.

(9) The location and length of the course for the speed tests shall be decided by the Government.

(10) The period of time for the climb shall start at the instant the wheels leave the ground for flight.

(11) Climbing and speed tests shall be made by a pilot in the employ of the company.

(12) Stop watches, barographs, and other instruments necessary for measuring the speeds and the rate of climb shall be provided by the Government. The fuel and oil shall be supplied by the Government.

(13) The inspectors may, at their discretion, prohibit unreasonable delays in performance tests, caused by adjustments in power plants or aeroplanes which should in the opinion of the inspectors have been made before the date of delivery as guaranteed in the contract.

(14) There shall be an inspection of the machines immediately after any test to show that all parts and connections of the power plant and of the aeroplane are in good condition.

V. INSPECTION AT FACTORY DURING CONSTRUCTION

One or more designated representatives of the Government will be present at the factory during the construction of the aeroplanes ordered. These representatives will be present in the capacity of inspectors, and will observe the following points, and such others as they may deem advisable:

That the constructors provide the proper strength of construction and the proper quality of material and grade of workmanship for each machine; that they make satisfactory provisions against deterioration of structural and other parts due to wear, vibration, and the action of salt water and moist air, varying climatic conditions, etc.

To determine that the constructors have an effective system of expert inspection to insure the above qualities.

That all details of construction conform to the best proved and approved practice.

To require such tests of material or of assembled or component parts as is deemed necessary, and observe such tests.

To reject any unsatisfactory part at any time during the construction of any machine at the factory.

To require supplementary tests as desired of materials and parts when deemed advisable.

To see that steel used in construction is of such a grade as to have high resistance to crystallization due to vibration.

The use of such other materials as have not been proved by test or experience to be nonsubject to crystallization due to vibration will be discouraged.

To see that provisions for the protection of metal parts, and adjoining wooden parts, against the corroding action of salt water and moist air, are satisfactory.

If laminated wood parts are used, to see that provisions for protecting them against the action of salt water, vibration, etc., are satisfactory. Particular care shall have been exercised to prevent access of moisture at faying surfaces, to end grain butts, scarfs, and joints, and such protection must be applied before the final assembly of parts.

To see that the threads of all bolts and nuts used in the construction conform to the S. A. E. standard.

Interchangeability of parts, assembled and component, fittings, etc., will be considered desirable, but this attribute should not interfere with others.

At the request of one of the inspectors, the contractor shall furnish the inspector the following:

Data which will show the capacity of the factory and affiliated factories, and the standing and the responsibility of the firm.

Drawings pertaining to the construction of the aeroplanes being supplied.

It will be considered desirable to have authenticated data from wind tunnel tests on an exact model of one of these machines, made to a suitable scale, as follows: Pitching moments (force vectors being plotted), at angles of incidence (mean chord, main planes) from — 9° to + 24°, observations taken every 3 degrees, and in addition at the following angles: Minus 2 degrees, minus 1 degree, plus 1 degree, and plus 2 degrees. The model shall have movable elevator surfaces cut off for the tests.

Data showing the elastic limit, hardness, and other important physical characteristics from authenticated records of tests on the exact steels (exact including final heat treatment, if any) used in the construction of the various parts.

Reliable historical information regarding the origin and time and method of seasoning of the material for wooden parts.

Records of tests of glue, cement, shellac, varnish, or dope when required; such tests should comprise alternately soaking in salt water and drying, etc.

In the event of a decided disagreement between inspector and manufacturer on a point which involves considerable expense on the part of the manufacturer in order to effect the change required by the inspector's suggestion the matter shall be referred to the officer in charge of the Aviation Section for decision.

Inspectors and their assistants shall be given free access at all times during the manufacture of aeroplanes or parts thereof being constructed in accordance with this specification to any and all parts of the factory in which a part of the aeroplane is handled.

Acceptance of an order under this specification shall signify that the contractor agrees to all of the provisions of this specification and that the true intent and purpose of these provisions will be adhered to.

GEORGE O. SQUIER,
Lieutenant Colonel, Signal Corps, United States Army,
In Charge of the Aviation Section, Signal Corps.

Over the Front in an Aeroplane

By Ralph Pulitzer. Published by Harper & Brothers, New York. Price, $1.00 net.

In this brief narrative Mr. Pulitzer not only gives a very graphic description of his flight "over the front," but tells, with a personal touch that gives vividness and life to his story, of his three-day "special trip" to the French battle lines, the Belgian artillery, and the Flemish trenches. Much has been published in the daily press and in magazines of the thrilling battles of the air and soldier life in the trenches, but Mr. Pulitzer's story is so simple, yet so complete in detail, that one's imagination is not racked. What he has seen makes you see quite as clearly, and the human incidents, which are its chief charm, are so many and so interesting that your attention is held throughout the narrative. It is all so believable; a true story of an American journalist's experience at the front.

Personal Pars

A drop of fifty feet with a broken aeroplane wing without an injury, is the record of Aviator Solbrig, a Davenport flyer. Solbrig was attempting a flight at the Marengo village fair. Rescuers ran to the wreckage of the plane but found Solbrig unhurt.

The Hugo, Oklahoma, Chamber of Commerce has signed a contract with Harry Weddington, aviator, for a series of six flights during the Choctaw county free fair to be held during the month of September. Weddington, who is a resident of Hugo, attended a course of instruction at the Florida aviation school and returning home had his plane, which is of the Curtiss type, built in Hugo under his own supervision, and has made more than a hundred flights from the local fair grounds. He has, besides the Hugo contract, an offer to give a series of flights at the Paris, Texas, fair.

DeLloyd Thompson has been engaged by the officials of the Western Michigan State Fair Association to give several flights as features of the fair which is to be held at Grand Rapids from September 18th to 22nd.

Willie Ritchie, ex-lightweight champion, has added to his accomplishments by qualifying for appointment as first lieutenant of the aviation reserve corps of the U. S. army. Combining knowledge of mechanics with the faculty to study, the San Francisco glove artist successfully passed the term of aviation instruction at the military encampment just brought to a close at Monterey. He ranked fourth among the members of the northern forces in the final examination.

Charles G. Williams, engineer in the automobile and aviation line, has resigned from the Mason Motor Co. to accept his appointment authorized by the Secretary of War as inspector of United States Army aeroplanes and aeroplane motors. His first duties call him to the Curtiss Aeroplane and Motor Corporation, Hammondsport, N. Y.

John C. Schleicher, of Mount Vernon, N. Y., has delivered his latest aeroplane to the experimental station on the premises of Dr. Joseph Hayes, at the shore in Blue Point. It is the intention of Mr. Schleicher to make a test in a series of try-outs at this station, among the rest a flying trip across the Great South Bay, when Dr. Hayes will be the only passenger.

AERO ENGINES ANALYZED

By CHARLES E. LUCKE

(*Continued from page* 631)

While no direct data on the possibility of attaining such rates by normal propagation are available it is likely that from interpretation of indirect data, they are probably not reached, so the rates are abnormal or maximum pressures not attained. At any rate conditions that could in any way improve this situation must be grasped and utilized. The first of these is concerned with mixture proportions which exert so strong an influence on the rate of propagation in explosive combustion. This is another argument for perfection of carburetion, and for the continuous maintenance of the exact proportions found best, because even a slight change of proportions, such as would never be noticed in an automobile, may exert a powerful influence under the steady high speeds of the aero engine. Next in order comes the flame path itself which if cut in half reduces the necessary combustion rate to half and this is partly a question of shape of combustion chamber and partly one of number and location of igniter plugs. It certainly should take less time to inflame the charge in an engine with valves in the head than in a tee-head form, for example, if each had one plug, so the former shape is preferable on this score. It would seem as if one plug located in the center of the head would ignite the whole charge in the time required for the flame to travel a distance equal to the radius and, therefore, that such a location would halve the time required by one plug located at the side, yet no such degree of difference has been established. Moreover, it would seem that two plugs simultaneously sparking, and located at opposite ends of one diameter would require more time to accomplish ignition than one in the center as each separate flame would have to travel more than a radius to burn all the mixture, and yet two such plugs seem to give a quicker combustion than the one in the center, instead of slower. This question of combustion rate versus spark plug location and number is still pretty well open, though clearly of considerable importance in securing proper combustion lines for most effective working. Reliability should also be served as there is a better chance of avoiding failure with two independent magnetos and two sets of spark plugs than one, and this much has been established as good practice, but accurate simultaneous sparking of both plugs is absolutely necessary.

There are two considerations that bear on the question, both of which require definite investigation. In the first place it is the volumetric rate of combustion that is of primary importance, not the linear rate. It is clear that a greater volume of mixture will be burnt with a fixed linear rate, if the ignition is at the center of a complete sphere of flame as the sphere has a greater volume for its radius than any other geometric body. This would seem to favor central ignition, but as the normal aero engine combustion chamber with head valves is a short cylinder in which the axis is short compared with the diameter, ignition at the center will burn in the first half of the total time a mixture volume proportional to the area of a circle of half the bore, while during the second half the circular ring between this circle and the cylinder wall will burn and this ring has three times the area and volume of the center cylinder. Therefore, with central ignition, the volumetric rate is low at first, and high at the end, averaging three to one in the second as compared to the first half, and it is the second half that is most important because here expansion is beginning and tending to lower pressures which it is the function of combustion to raise. If the situation be reversed so that the higher rates occur in the early part of the period available, then there will be less to burn after expansion has started and this will be accomplished by two plugs. The second consideration is that of non-uniform rate of propagation or accelerated combustion, and recognizes that mixtures which are agitated burn much faster than those that are quiet. The advancing combustion wave started at any ignition point agitates the mixture beyond, somewhat like a compression wave, and two ignitors may be expected to increase this agitation and so accelerate combustion, compared with single point.

Whatever the rate of combustion, it is necessary to start combustion before the end of compression, and the slower the combustion rate, or the higher the piston speed, the more advance must be allowed. This advance, needed to limit the combustion completion time must be as small as possible because pressure rise during compression is just as detrimental as excessive friction, and is accepted at all only as the lesser of two evils. It would seem as if, with sufficiently high volumetric rates of combustion, and a sufficiently large number of ignition points, spark advance would be minimized. Manual advance might even be eliminated entirely as an operator's adjustment, if the magnetos and distributors used had proper electrical characteristics with speed increases to give earlier sparks passage at higher speed. With widely varying throttle openings and engine speeds, such as are typical of auto engines, chances of success are more remote than with aero engines where speed and throttle positions are changed so seldom.

While it is possible to experimentally determine the degree to which each process step important to the power weight ratio has been executed in an aero engine, and to measure the precise amount of disturbing effect of each interfering influence to be encountered in practice and, therefore, experimentally study processes with reference to reliability and adaptability as well, no such work appears to have been undertaken or, if it has, the results have not been recorded. All that has been published with respect to the judging of process fulfillment has been concerned with a few simple over-all measurements of horsepower, speed, and fuel consumption from which some conclusions are derivable, but not of such significant value to designers and operators of engines as would be the case with true investigation work of the analytical character that accounts separately for each factor that enters into the result. As has already been pointed out, these results are subject to some interpretation by comparison, one with the other, and each with thermodynamic standards. All the facts necessary for the latter are not available, and must be assumed in part, so the conclusions will be correspondingly approximate and subject to caution in use.

From the measured brake horsepower and speed, the speed can be eliminated by division and a quality obtained which measures the effectiveness with which those processes that are concerned with output have been executed, and this is the mean effective pressure referred to brake horsepower. This quantity, of course, includes all negative work of gas friction through carburetor header ports, valves, and exhaust muffler, all mechanical friction, all fan, pump, and magneto work; all negative work of precompression in two-cycle engines and the windage of rotating cylinder engines. For the most satisfactory conclusions these included items of loss should be separately determined and certainly the motor cylinder work done behind its piston should be isolated from the rest, but up to the present the only separate factor thus embraced is the windage of the rotating cylinder

TABLE IV.—*Mean effective pressures referred to brake horsepower versus engine classes.*

Class No.													
I.		II.				III.		IV.					
Cylinder-crank arrangement.													
Fixed in line.		Fixed V, 2 cylinders per crank.				Rotating.		Fixed star.				Miscellaneous.	
Cooling.													
Water.		Air.		Water.		Air.		Air.		Water.		Air.	
Engine or maker.													
Benz.		De Dion-Bouton.		Curtiss.		B. M. & F. W.		Anzani.		Laviator, 2 cycle.		Ashmusen.	
M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.
106.9	Bendman......	67.3	"Flight"......	107.7 111.7 104.7	Maker..........	66.6	B..............	76.5 78.5 76.9	Maker..........	65	"Flight"......	77.5	Maker.
Daimler.		Renault.		Sturtevant.		Gyro.		Anzani.		Salmson.			
114.4	B..............	64.1 60.2	"Flight"......	100	Maker..........	76.9	B..............	83.2 80.1 86.8	Maker..........	83.5 92.8	"Flight"......	....	
Daimler.		Wolseley water-cooled exhaust box.		Sunbeam.		Gnome.		Edelweiss.					
103.5	B..............	79	"Eng'g"......	127	Maker..........	75.0	B..............	97	"Flight"......	....	....	....	

Daimler.				Rausenberger.		Gnome.		Laviator, 2 cycle.					
102.0	B			103	Marker	71.3	B	57.2	"Flight"				
Daimler.				Clerget.		German Gnome.		1911 Anzani.					
107.1	B			101.5	"Flight"	67.9 / 67.2	Maker	99.56	Lumet				
Daimler.				Laviator.		German Gnome.		1911 Nieuport.					
107.0	B			106 / 92.5	"Flight"	78.7 / 65.2	Maker	86.76	Lumet				
Daimler.				Panhard Levassor.		Le Rhone.							
104.8	B			82	"Flight"	85.6 / 89.2	Maker						
Daimler.				Wolseley.		Clerget.							
98.0	B			77	"Eng'g"	57.6 / 72.8	"Flight"						
N. A. G.													
106.0	B												
N. A. G.													
94.9	B												
Argus.													
M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.	M.E.P.	Authority.
106.5	B												
Argus.													
107.5	B												
Argus.													
101.1	B												

engines in the German tests. Comparison of these over-all competition test results giving the mean effective pressure referred to brake horsepower with each other is possible from Table IV.

Values of mean effective pressure exceeding 114 pounds per square inch, referred to brake horsepower, reported for one engine, and in many instances in excess of 100 pounds per square inch for water-cooled fixed-cylinder engines, warrant the conclusion that little betterment is possible in view of the prevailing lower figures in engines of other classes. These attained values are truly remarkable and can hardly be exceeded unless the initial pressures are raised above atmosphere by blowers. That some engines do not attain these values is proof of their inferiority of design, but there is some question as to capacity for maintenance of the high value after long periods that can be settled only after very long trial runs. The contest figures are reliable and acceptable for the conditions imposed, and if such values can be maintained in flight, little more can be expected. Such a high value as 127 pounds reported by one maker can hardly be credited, nor can so low a value of 74 pounds be regarded as good enough to be acceptable. Air-cooled cylinder values are consistently lower even for fixed cylinders and much more so for rotating cylinders, which indicates a fundamental inferiority.

There is some question of the validity of a comparison of mean effective pressures for different engines at unequal speeds, especially as rotating cylinder engines are never run over 1,500 revolutions per minute while fixed cylinder engines are operated over 2,000 revolutions per minute. To eliminate such an objection and at the same time permit of a judgment of the best speed at which to run an engine of given design, the horsepower-speed curve should be determined, or its equivalent curve of mean torque speed, or of mean effective pressure referred to speed. It is evident that, if with an increase of speed the mean effective pressure remains constant, then the horsepower will be proportional to speed, and the best speed to use for aero engines will be the highest at which the inertia or centrifugal forces are not excessive, assuming proper bearing conditions to be provided. This best maximum speed for fixed cylinder engines is undoubtedly the speed at which the inertia force of the reciprocating parts at the beginning at the outstroke is equal to the normal maximum gas-pressure force acting on the piston. For these conditions the force transmitted to the crank pin at the moment of explosion will be zero, gradually rising through the stroke and will be maintained high until near the end of the outstroke during the last half of which the increasing inertia forces are additive to the lessening gas pressure forces. During the idle stroke of suction the inertia force acting alone imposes just the same crank-pin forces as would the explosion when starting. Any less inertia while reducing the transmitted crank-pin forces for idle strokes increases them at the beginning of the working stroke. As the normal or most used speed is less than the maximum and the maximum gas pressures likewise, this normal condition and not that of maximum should be made the basis of selection of operating speed for minimum weight of engine, coupled with general serviceability. The speed at which normal maximum gas pressures will be balanced against reciprocating inertia, which is a function of the square of the speed and of the weight of parts directly, will, of course, depend on these weights. Heavy reciprocating parts may be best operated at lower speed than light reciprocating parts which include piston, wrist pin, and part of the connecting rod.

(To be Continued)

BURGESS-DUNNE HYDROAEROPLANE

As the Burgess was the first hydro application of the inherently stable Dunne principle, much interest was attached to its first trials. After demonstrating the practicability of the pontoon arrangement, steady advancements in constructional details and refinement of design have been noticeable.

Machines of the type illustrated have been delivered to the New York and Massachusetts Naval Militia, and are the latest type constructed by the Burgess Company of Marblehead, Mass. Comparison with the Dunne machine described in Aerial Age of April 19, 1915, will show the present machine's superiority of design.

The Dunne principle is probably too well known to need much description. The wing formation is such that at the center the planes have a lifting angle. From the lifting angle the planes are twisted at the ends to a depressing or negative angle. Each rib, therefore, is slightly different than the next, both in curvature and in location of its maximum camber. The camber increases towards the tips, the center ribs being rather flat, while those at the tip are given a pronounced camber.

General Dimensions

Span	46 ft.
Chord	5 ft.
Gap	5 ft. 3 in.
Total plane area	470 sq. ft.
Motor	90 H. P.
Propeller	9 ft.
Speed Range	65-40 M.P.H.
Climb first minute	300 ft.

Planes

Above the nacelle is the central wing panel, 26 in. wide. Sections of the upper plane are attached to this. Lower plane sections attached near bottom of nacelle. From the central panel and nacelle, planes run back at an angle. Leading edge 25 ft. long at each side.

The Burgess-Dunne Seaplane used by the Second Battalion N. Y. Naval Militia.

As mentioned before, planes are at a positive angle at center of machine, gradually decreasing to a neutral angle or flat at the center of each wing section, and then to a negative angle at the tips. Planes are detachable at a point about 14 ft. from nacelle, these detachable panels having the ailerons or wing flaps attached.

Wing flaps on upper plane are connected to those on the lower by three No. 80 gauge piano wires.

Struts are spaced from either side of nacelle, 5 ft. 2 in., 5 ft. 6 in., 5 ft. 11 in., and the end struts 7 ft. 0 in. Two vertical side areas or panels are built in between these end struts. They are not in any way controllable, and are used to prevent side slip. Tips of planes extend 19 in. beyond the side areas.

Steel wires of different gauges are used in the strut-wiring At the center, heavy 130 gauge wires are used, diminishing in size to the end panel wiring, where 80 gauge wire is employed. A wire runs through struts from the end panel to nacelle. This is to take any outward strain that may be given the end panel, and it has been found to also eliminate vibration in the struts through which the wire passes.

Nacelle

On account of the position of the planes, the pilot has an exceptionally clear view in practically every direction. Either the forward or rear seat is occupied by the pilot, as a dual control system is installed.

Nacelle measures 17 ft. 6 in. from nose to radiator, 26 in. wide and an overall depth of 3 ft. 6 in. at the rear seat. Sides are covered with treated linen, and the curved top is formed of cedar veneer. Motor hood, at the rear, is alluminum.

Internal construction is the usual wired spruce members. Seats are comfortably arranged and upholstered. A 2 in. circular opening in the back of rear seat allows a crank handle to be inserted and connected with the motor for starting without it being necessary to leave the cockpit. The crank, when not in use, is placed in a clamp attached to the nacelle next to the motor hood.

Instruments on the dash goard are: Inclinometer, Warner Tachometer, Haustetter Altitude meter, Puritan switches and Waltham clock.

Controls

Hinged to rear beams of planes are four wing flaps. These perform the functions of rudder and elevators. For climbing, the wing flaps on both sides of machine are pulled up, and the downward pressure thus caused, acting on that part of the wings which is behind the center of weight, forces the nose upward and increases the angle of incidence, thereby making the machine climb. For descent, the reverse procedure takes place, and since the ailerons on both sides are depressed, thus raising the rear of machine, it is caused to descend.

Recently a "Dep" control was installed in place of the two control levers usually installed. The above mentioned control movements are accomplished by a forward and backward motion of the control column.

For turning to right and left, the control wheel is turned as for banking, as the machine uses no directional rudder. In this movement, one flap is raised and the other lowered, and this is made possible by running a separate control wire from the wheel to the flaps at either side.

The manner of running control wires for installation of the "Dep" control system is original with the Burgess Company. Flexible 3/8-in. cable is used where control wires run over pulleys or sheaves.

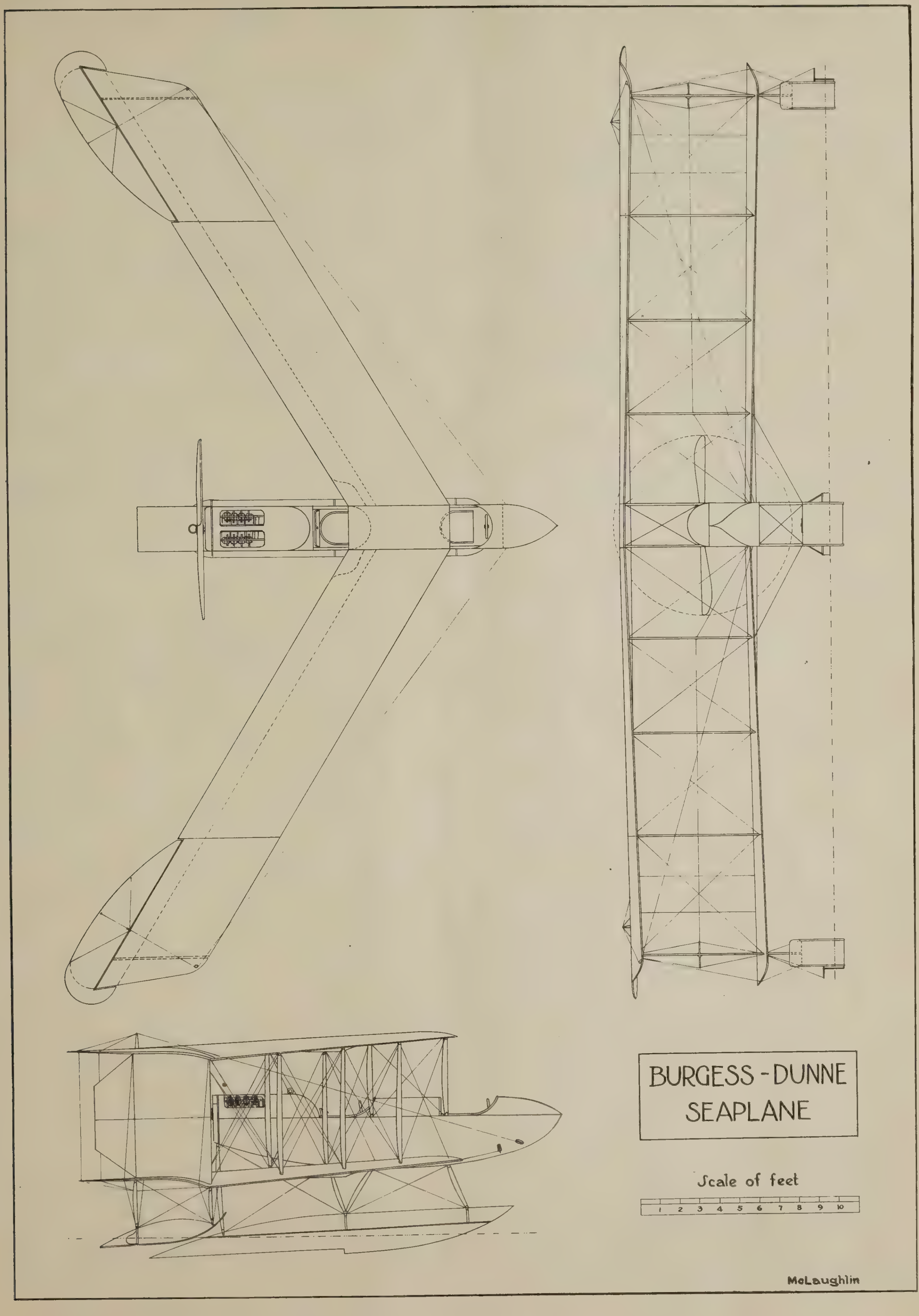
Floats

Central main float or pontoon is 18 ft. long, 2 ft. 2 in. wide and 2 ft. deep at the center. It is rigidly mounted and attached to the nacelle with spruce struts. It is divided into six compartments, each of which is provided with a 6 in. hand hole for drainage.

Top, sides and bottom are of 3/8-in. cedar. Narrow ash battens are run along the edge of bottom to protect it when in contact with ground.

Planing boards, 4 in. wide cedar, 3/16 in. thick, are attached at each side of float, 6 in. from the top, held in place with strap steel brackets. The accompanying drawing shows their position in relation to the water, when at rest. Forward ends are about 4 in. above water; rear ends just touch the water. Water line indicated by dash and dotted line. When in motion, planning boards have a lifting angle to the water, and

(*Continued on page* 705)


BURGESS - DUNNE
SEAPLANE
Scale of feet
1 2 3 4 5 6 7 8 9 10
McLaughlin

CHARACTERISTIC CURVES FOR WING SECTION, R. A. F. 6

By H. E. Rossell, Assistant Naval Constructor, U. S. Navy; C. L. Brand, Assistant Naval Constructor, U. S. Navy, and D. W. Douglas, S.B.

In order to furnish a final check upon the calibration of instruments, the alignment of tunnel and balance and general methods of testing, it was considered desirable to repeat the determination of the aerodynamical constants published by the British Advisory Committee for Aeronautics, Report 1912-13, for the wing profile, designated as R. A. F. 6.

Two models 18 inches span by 3 inches chord were cut in brass, and carefully filed and scraped to form. The surface was highly polished to remove tool marks.

Each model was mounted vertically in the wind tunnel and its "lift" and "drift" forces measured on the balance for angles of the chord to the wind from — 4 degrees to + 18 degrees.

The moment of the resultant force about the vertical axis of the balance was measured on the torsion wire. It was then possible to determine the direction of the resultant from the ratio $\frac{\text{lift}}{\text{drift}}$, the magnitude by $\sqrt{\text{Lift}^2+\text{Drift}^2}$, and its line of action from: $\frac{\text{observed moment}}{\text{magnitude}}$ =perpendicular distance from axis.

The center of pressure is usually defined arbitrarily as the intersection of the resultant force with the plane of the chord. This point was calculated for each incidence.

On figure 10 are plotted the values of lift and drift coefficients, defined by:

$$K_y = \frac{\text{Lift}}{AV^2}, \quad K_x = \frac{\text{Drift}}{AV^2},$$

where A is the wing area in square feet, and V the velocity of the wind in miles per hour. Lift and drift are in pounds force, hence K_y is the force in pounds on 1 square foot due to a wind of 1 mile per hour, of air of standard density (*i. e.*, .07608 pound per cubic foot).

The "center of pressure" is also shown on figure 10 in terms of distance from leading edge in fraction of chord.

On the same sheet are shown the experimental points published by the National Physical Laboratory for this wing, using the same size model and the same speed, *i. e.*, 29.85 miles per hour.

It is seen that there is only slight discrepancy between the lift observations up to an incidence of 14 degrees, the useful range in aviation. The English points lie from 1 to 3 per cent higher than the corresponding points for model B, and coincide with those of model A.

Similarly for the drift observations there is very good concordance up to 14 degrees.

The curve of center of pressure coefficient is in practical coincidence with the English observations.

It appears that undetected differences in workmanship and finish between two models may cause a change in coefficients of not more than 3 per cent. Actual observations are precise within one-half of 1 per cent. Consequently, our results may be considered sufficiently precise for purpose of aeroplane design.

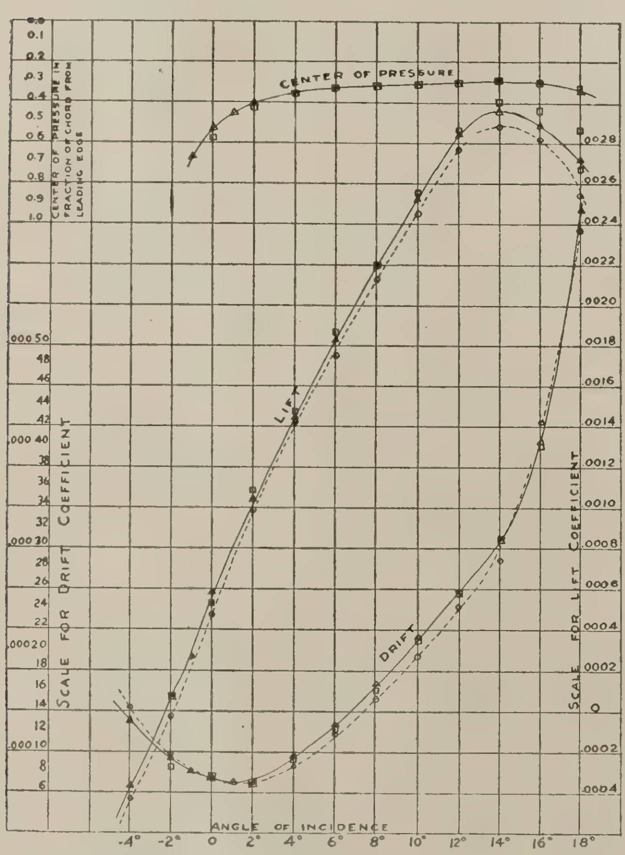


Fig 10—Wind characteristics.

Aerofoil R. A. F. 6.
Velocity 29.85 miles per hour.
Density of air 0.07608 pound per cubic foot.
Nat. Phys. Lab. observations.
Mass. Inst. Tech. observations, model A.
Mass. Inst. Tech. observations, model B.

Fixed Formulae Dealing with Geometrical Problems

$$\text{Circumference} = \frac{710 \times \text{Diameter}}{226}$$

$$\text{Diameter} = \frac{226 \times \text{circumference}}{710}$$

$$\text{Diameter} \times \frac{99 \times \text{side inscribed square}}{70}$$

$$\text{Side inscribed square} = \frac{70 \times \text{Diameter}}{99}$$

$$\text{Diameter} = \frac{70 \times \text{side of equal square}}{79}$$

$$\text{Side of equal square} = \frac{79 \times \text{Diameter}}{70}$$

$$\text{Circumference} = \frac{39 \times \text{side of equal square}}{11}$$

$$\text{Side of equal square} = \frac{11 \times \text{circumference}}{39}$$

$$\text{Diagonal of square} = \frac{99 \times \text{side of square}}{70}$$

$$\text{Side of square} = \frac{70 \times \text{diagonal of square}}{99}$$

$$\text{Area of circle} = \frac{322 \times \text{Area of inscribed square}}{205}$$

FOREIGN NEWS

AUSTRIA

General Headquarters on August 10th made public the following: "Twenty-one of our aeroplanes visited Venice on the night of Aug. 9, dropping three and a half tons of bombs, causing a dozen fires, one in cotton mills, which was of such dimensions that it could be seen for twenty-five miles. The machines returned unharmed."

An enemy airship, presumably Italian, on August 5th, fell into the sea, ablaze, near Lissa Island. Austrian torpedo boats were able to save only the debris of the baloon cover. None of the crew was found.

FRANCE

The following is the official French report for August 5th:

"Aviation—The German aeroplane which fell near Moranville and was reported in the communication of this morning was brought down by Sergeant Lenoir. This is the sixth enemy aeroplane accounted for thus far by this pilot."

"On the Somme front French scouting aeroplanes delivered seventeen attacks upon the enemy, during the course of which two German machines were seriously damaged and compelled to land precipitately within their lines. Two other German aeroplanes were brought down in the region of Verdun. One fell near Abaucourt and the other not far from Moranville."

The official report for August 6th follows:

"This morning one of our pilots brought down successively two enemy aeroplanes in the region of Verdun. One fell in the French lines, the second between the German trenches and our trenches. The same morning, after a combat, another German machine was compelled to land within our lines at Moyenneville, north of Estrees. The two enemy aviators were made prisoners. The machine was of a recent model. It was intact.

"On the night of August 5 and 6 our air squadrons dropped forty shells on the region of Combles, eighty-four on the station of Noyon, thirty on the stations of Stenay and Sedan, forty on the station of Conflans, sixty on the Sablons station at Metz and the railway establishments there, and forty on the military establishments of Rombach, north of Metz.

"Several of these squadrons made two consecutive raids. One of them made no less than seven raids during the same night.

"On the Somme front our aeroplanes set on fire two German captive balloons.

"A German aeroplane dropped four bombs on Baccarat. There were no casualties and the damage was insignificant."

The report for August 7th and 8th follow:

August 7th—"One of our pilots brought down a German machine which fell in flames in the enemy lines north of Auberive. Yesterday a German aeroplane dropped four bombs on Nancy. Five of the civilian population were wounded, three of them grievously."

August 8th—"A German aeroplane over Luneville has been forced to come to earth in front of our lines. French artillery destroyed the machine on the ground.

"On the Somme front French aviators have delivered numerous aerial attacks. Six German machines, seriously damaged, descended precipitately within their lines. A captive balloon of the enemy was destroyed on the night of August 8-9. One of our aviators has thrown down projectiles on the powder factory at Rottweil on the Neckar. One hundred and fifty kilos (330 pounds) of explosives were thrown down on the factory buildings, and as a result two very extensive fires and several explosions were observed. This machine left at half-past eight P. M., and was back from its trip at five minutes to twelve P. M., having accomplished at night a raid over a distance of 350 kilometers (217 miles), which was rendered particularly difficult by the necessity of going over the Vosges Mountains and the Black Forest.

"Furthermore, on the night of August 8-9 other French aeroplanes threw down forty-four shells upon the railroad stations at Audun-le-Roman, Longuyon and Montmedy, and eighty-eight shells upon the railroad station at Tergnier and the station at La Fere."

Bert Hall, the American aviator, has just felled his third enemy aeroplane above Fort Douaumont after a thrilling battle 12,000 feet in the air. Sergeant Lufberry has felled his second. Norman Prince, who left on a regular flight, is reported missing.

On August 8th Sergeant Lufberry, the American aviator, brought down another German machine. When Lufberry gets one more his name will be mentioned in the communique.

Norman Prince, who was reported missing after a flight over the German lines, returned on August 8th. His motor stopped and, being compelled to land, he came home on foot.

In the course of aerial engagements on the 8th and 9th of August more than half a dozen German aeroplanes and five allied aeroplanes were brought down.

French aviators delivered fifteen attacks on enemy positions, dropping 413 projectiles.

The French report of aerial engagements says:

"On the Somme front French aviators yesterday delivered fifteen attacks. A German machine was brought down between Herly and Bethonvillers. Two others were compelled to descend after engagements with French machines, in the region of Combles. During the day of August 9 and the night of August 9-10 French aerial squadrons took part in the following bombing operations: Ninety bombs thrown down on railroad stations on the front between Lassigny and Combres, 138 shells on the station at Dugny, forty at Appilly, thirty-eight shells thrown down upon a battery in action in the region of Noyon, fifteen upon the railroad station at Banzancourt, ninety-two upon the stations at Spincourt and Damvillers and on surrounding bivouacs—a total of 413 projectiles."

The following is the official report for August 7th:

"On the Somme front our aviators engaged in numerous combats. Three German machines were brought down, one near Roiglise, the second in the vicinity of Omiecourt, the third north of Nesle. Three other enemy machines were seriously damaged and compelled to land behind their own lines. Finally two captive balloons were destroyed. On the right of August 6-7 French aerial squadrons carried out the following operations successfully: Twenty bombs were dropped on the railway station at Metz-Sablons; thirty on the railway station at Thionville; twenty-five on factories at Rombach, north of Metz, and twelve on military camps near Etain."

The following is the official French statement for August 11:

"On the night of August 9-10 French aerial squadrons bombarded the railway station and barracks at Vouzieres and the station at Bazancourt."

Dennis Dowd, a young Brooklyn lawyer, who joined the French Flying Corps last May, was killed at Buc on August 11th by falling from a height of 300 feet. Dowd had almost completed his training course preparatory to entering active service with the French Army and was reported to be the best of the Americans at the training school.

GERMANY

"On the night of August 7 enemy airmen dropped bombs on Rothwell, Wuerttemberg," says an official statement issued at Berlin on August 11th. "A dwelling house was hit and several persons were wounded. No military damage was done."

Another report from Berlin, on the same date, is as follows: A squadron of Austrian naval aeroplanes on the night of August 8 successfully bombarded enemy battery positions at the mouth of the Isonzo and the hostile naval station at Gorgo. The naval planes returned unharmed, though they were violently shelled.

The official army headquarters statement for August 9th contains the following regarding aviation operations:

"Results of aerial fighting during July: German losses in aerial fights were 17 machines; shot down from the ground, 1; missing, 1; total, 19 machines. French and British losses in aerial flights were 59 machines; shot down from the ground, 15; by involuntary landings within our lines, 6; at landings for setting down spies, 1; total, 81. Of the above 48 are in our possession."

An official statement issued by the German Admiralty under date of August 5 says:

"A German hydroaeroplane off the Flanders coast engaged an enemy battleplane, which was shot down and completely destroyed. This was the fourth hostile aeroplane conquered by Naval Lieutenant Boensch. On the way home this officer also forced another adversary to land behind the enemy lines."

The Germans claim heavy damage was inflicted by bombs from Zeppelins in the raid over England on August 9th. The statement is as follows:

"Several of our naval airship squadrons on Tuesday night again attacked England, lavishly dropping explosive bombs of the heaviest calibre and incendiary bombs upon naval bases on the East Coast and industrial plants of military importance in the coastal counties from Northumberland down to Norfolk. At all places our success was notable and could be distinctly observed, the night being comparatively bright."

"In the iron and benzol works near Middlesborough there were very heavy explosions and great fires, and in the harbor installations of Hull and Hartlepool and also in the dockyards on the Tyne a great explosive and incendiary effect was ascertained. Also in industrial plants near Whitby, and railway plants near King's Lynn a marked effect was secured."

Commenting on the Berlin statement regarding Tuesday night's Zeppelin raid over England a British official statement says:

"The German report is the usual perversion of the truth."

GREAT BRITAIN

An air raid over the port of Dover by two German seaplanes was carried out on August 12th. Four bombs were dropped, injuring one officer and six men, but no material damage was done.

The following report was issued on August 11th: "Besides numerous daily raids, some successful long-distance raids recently have been carried out by the flying corps against the following objectives: Zeppelin sheds at Brussels, railway sidings at Mons, railway sidings and airship sheds at Namur, Busigny railway station (twice), Courtrai railway station (twice). Of the sixty-eight machines which participated only two failed to return."

British naval aeroplanes reached the vicintiy of Brussels in an air raid, the War Office announced. On August 9th eight bombs were dropped on an airship shed near the city. The announcement follows:

"At daybreak this morning, under heavy fire, an attack was carried out by naval aeroplanes upon an enemy airship shed at Evere, near Brussels. The objective was successfully bombarded from a height of 2,000 feet and eight bombs were observed to hit the shed."

The official report for Great Britain for August 8th follows: "On July 30, in conjunction with the French, an attack was made by British naval aeroplanes on benzine stores and the barracks at Muelheim. The machines met with a very heavy anti-aircraft fire, but succeeded in gaining their objective and carried out a successful bombardment. Our machines returned safely."

"An enemy squadron of ten aeroplanes endeavored to cross our lines yesterday on a bombing expedition. Two of the hostile aeroplanes had to make forced descents behind their own lines.

ITALY

The following is the official Italian report for August 7th:

"A squadron of our Caproni aeroplanes bombarded the railway junction at Opcina (northeast of Trieste) under unfavorable atmospheric conditions and drove back hostile aeroplanes, one of which was brought down. One of our aeroplanes failed to return."

The official report for August 5th follows: "An enemy aeroplane dropped bombs on the railway station at Bassano, hitting some trucks. The casualties were one killed and two wounded. A squadron of our Voisin aeroplanes dropped thirty-five bombs on the railway station of Nabresina. Good results were observed."

Great damage was done in the recent Italian air raid near Trieste. Twenty machines dropped four tons of explosives blowing up a great petroleum reservoir and destroying nearby buildings. Three buildings of a torpedo factory were wrecked.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

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Motors for Model Aeroplanes

(*Continued from page* 592)

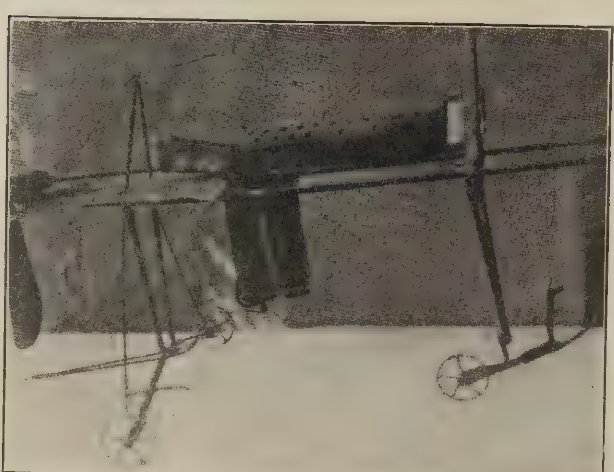
Gasoline Motors

Although numerous model constructors in America are experimenting with model gasoline motors, the Midget Gasoline Motor, the product of the Aero Engine Company, is perhaps the most satisfactory up to the present time. An engine of this type was used by Mr. P. C. McCutchen of Philadelphia, Pennsylvania, in his 8-foot Voisin Type Biplane model for which he claims a number of satisfactory flights.

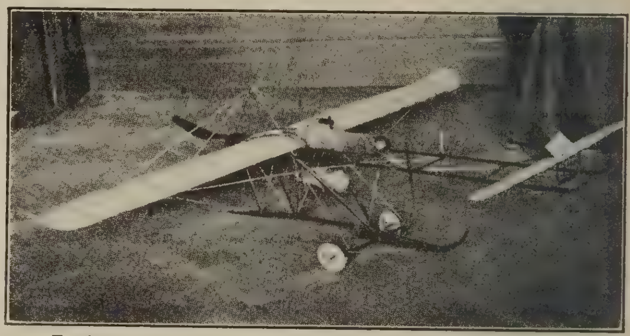
The motor is made from the best iron, steel, aluminum and bronze and the complete weight including a special carburetor, spark plug and spark coil is 2½ lbs. From the top of the cylinder head to the bottom of the crank case the motor measures 7″. It is possible to obtain from this motor various speeds from 400 to 2700 r.p.m. at which speed it develops ½ h.p. The propeller used in connection with this motor measures 18″ in diameter and has 13″ pitch.

Steam Power Plants

Aside from the gasoline motor there is the steam driven motor which has been used abroad to a considerable degree of success. Owing to the difficulty in constructing and operating a steam-driven motor, very few model flyers in America have devoted any attention to the development of this motor as a means of propulsion for model aeroplanes. But irrespective of the limitations of the steam motor a great deal of experimentation has been carried on in England, and without doubt it will soon be experimented with in America. Perhaps one of the most successful steam power plants to have been designed since the development of the Langley steam-driven model is the Groves type of steam power plant, designed by Mr. H. H. Groves, of England. On one occasion several flights were made with a model driven by a small steam engine of the Groves type weighing 3 lbs. The model proved itself capable of rising from the ground under its own power and when launched it flew a distance of 450 feet. This is not a long flight when compared with the flight made by Prof. Langley's steam-driven model on November 28, 1896, of three-quarters of a mile in 1 minute and 45 seconds, but the size of the models and also that Mr. Groves' model only made a duration of 30 seconds, must be considered. The model was loaded 12 ounces to the square foot and had a soaring velocity of some 20 m.p.h. The total weight of the power plant was 1½ pounds. Propeller thrust 10 to 12 ounces. The total weight of the model was 48 ounces. The type of steam plant used in connection with this model was of the flash boiler pressure fed type, with benzoline for fuel.



Type of flash boiler used in English models. Designed by H. H. Groves



English model monoplane driven by a steam power plant

Mr. Groves has done considerable experimenting with the steam-driven type power plant. Many of the designs used in the construction of steam plants for models are taken from his designs. A Groves steam power plant is employed in one of Mr. V. E. Johnson's (Model Editor of *Flight*) model hydroaeroplanes, the first power-driven, or "mechanically driven" model hydroaeroplane (so far as can be learned) to rise from the surface of the water under its own power. This model has a total weight of 3 pounds 4 ounces.

Another advocate of the steam driven type model is Mr. G. Harris, also of England. Several good flights were made by Mr. Harris with his pusher type monoplane equipped with a steam-driven motor. As a result of his experiments he concluded that mushroom valves with a lift of 1-64 part of an inch were best, used in connection with the pump, and at least 12 feet of steel tubing should be used for broiler coils. The first power plant constructed by Mr. Harris contained a boiler coil 8 feet long, but after he had replaced this coil with one 12 feet long, irrespective of the fact that the extra length of tube weighed a couple of ounces, the thrust was increased by nearly a half pound. The principal parts used in Mr. Harris's steam power plant was an engine of the H. H. Groves type, twin-cylinder, ⅞″ bore, with a piston stroke of ½″. The boiler was made from 12 feet of 3/16″ x 20″ G. steel tubing, weighing 10.5 ounces. The blow lamp consisted of a steel tube, 5/32″ x 22″ G. wound round a carbide carrier for a nozzle. The tank was made of brass 5/1000″ thick.

The pump 7-32″ bore, stroke variable to 1-2″, fitted with two non-return valves (mushroom type) and was geared down from the engine 4.5 to 1.

The Langley steam driven model, of which so much has been said and which on one occasion flew a distance of one-half mile in 90 seconds, had a total weight of 30 lbs. the motor and generating plant constituting one quarter of this weight. The weight of the complete plant worked out to 7 lbs. per h.p. The engine developed from 1 to 1½ h.p. A flash type boiler was used, with a steam pressure of from 150 to 200 lbs., the coils having been made of copper. A modified naphtha blow-torch, such as is used by plumbers, was used to eject a blast or flame about 2000 Fahrenheit through the center of this coil. A pump was used for circulation purposes. With the best mechanical assistance that could be obtained at that date, it took Professor Langley one year to construct the model.

(*To be continued*)

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials cf contributor will be printed when requested.

THE AERONAUTICAL DISPUTE

The Balloon, the Helicopter and the Ornithopter Are in Violent Dispute

By R. E. de Castro

The Balloon:
Since time began when man first sought to fly,
The heavens to explore, the stars to view,
When wearied of this earthly realm, he strove
To get into the air, I served him well.
Though heavy was his weight, and rough the wind
I always went aloft o'er cheering crowds below,
And flew before the wind—

The Rest:
And very often burst!

The Balloon:
I will thank you to be silent while I speak
And not indulge in personalities.
My only plaint is this—it is not fair
For man so soon forgetting what I did,
To push me to one side and look around
For something new to carry him in flight.

The Chorus (sarcastically):
"Sing basket, sing hot-air, sing hydrogen gas,
"'Tis sad but it's true, the balloon's day is past."

The Ornithopter:
To emulate the birds I try
Now watch me flap my wings,
I'll go aloft and stay up there
Till the bird at morning sings.
(He flaps his wings furiously but does not move.)

The Rest:
Ha, ha! old boy, you did your best,
You can really do no better,
To try to fly you might as well
Be fastened by a fetter.

The Chorus:
Sing wing flaps, sing engine, sing "Flight like a bird,"
Of his equal in rashness we never have heard!

The Helicopter:
The only way to really fly is not by imitation
The means *I've* found, which I will show and without hesitation.
Now watch me as I cleave the air—prepare for jubilation,
You see the thing is easy after due deliberation.
(The Orinthoper whirls in a frenzy, but does not move.)

The Chorus:
Sing, whirling propellers, sing "straight off the ground,"
You're useless, old fellow, go back and sit down.

The Balloon:
But what is this which now appears to view,
This thing of beauty, graceful, straight and strong?
Let's watch it, brothers, see what it will do.
(The aeroplane enters.)

The Aeroplane:
I'll not indulge in boasts as ill befit
A man of learning, power and of skill;
But keep your eyes on me as now I rise
Into the air, and see how it is done.

(The Aeroplane rises and flies, to the utter astonishment of the rest, who sink feebly to the ground.)

The Chorus:
Sing, basket, sing, hot air, sing, hydrogen gas,
Sing, whirling propellers, sing "straight off the ground,"
'Tis sad but it's true, the Balloon's day is past,
As for you, Helicopter, go back and sit down.
Sing, wing flaps, sing, engine, sing, "flight like a bird,"
Of their equal in rashness, we never have heard.

The Aeroplane disappears in flight while the others slink home, muttering to themselves.

"How many miles can you go on a gallon?"
"How many can you?"
"I asked you first."

"I'm digging a well for exercise."
'How are you getting on?"
"Fine. Drop in on me some day."

Fame

A Long Island teacher was recounting the story of Red Riding Hood. After describing the woods and the wild animals that flourished therein, she added:

"Suddenly Red Riding Hood heard a great noise. She turned about, and what do you suppose she saw standing there, gazing at her and showing all its sharp, white teeth?"

"Teddy Roosevelt!" volunteered one of the boys.—*New York Times.*

Pretty Lively

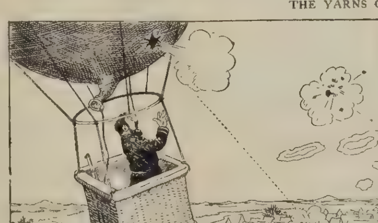
Doctor—Well, and how did you find yourself this morning?

Patient—Oh, I just opened my eyes and there I was.—*The Purple Cow.*

Motor Expert—Is your new motor car a good hill climber?

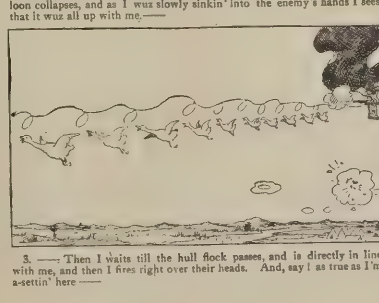
'Fine," replied Mr. Chuggins. "I only wish it would draw the line at hills. Sometimes it wants to try a tree or a telegraph pole."

THE YARNS OF CAPTAIN FIBB.

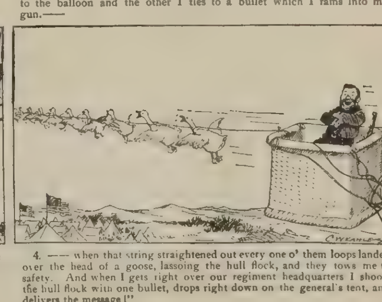


1. "That reminds me of a terrible experience I had when I wuz a scout durin' the war. I wuz carryin' a message to the front in a balloon through the enemy's country, when a shot whizzed through the gas bag! The balloon collapses, and as I wuz slowly sinkin' into the enemy's hands I sees that it wuz all up with me.——

2. —— Just then I sees a flock o' wild geese come along in the distance and I gets an idee! I happens to have a ball o' twine with me, so I quick ties a lot o' small loops into it, about two feet apart, and fastens one end to the balloon and the other I ties to a bullet which I rams into my gun.——



3. ——: Then I waits till the hull flock passes, and is directly in line with me, and then I fires right over their heads. And, say! as true as I'm a-settin' here ——



4. —— when that string straightened out every one o' them loops landed over the head of a goose, lassoing the hull flock, and they tows me to safety. And when I gets right over our regiment headquarters I shoots the hull flock with one bullet, drops right down on the general's tent, and delivers the message!"

Condition of Tests at U. S. Experimental Model Basin

Aeronautical tests at the Washington Navy Yard can be undertaken at any time when it does not interfere with government work.

For testing a model of an aeroplane or single surface at a constant speed of 40 or 50 miles an hour, with angles of incidence varying from —4 to +20 degrees, and computing the lift and drift and positions of the resultant air forces and plotting same; also a test at one angle of incidence with speeds ranging from 30 to 70 miles an hour; the charge is approximately $50.00.

Models should not be over 36 inches in width, and may be made either of wood or metal. If made of wood, it is best to have the wings made of laminated wood strips about one inch in width.

Where more extensive tests are required, the estimated cost of the same will be supplied upon request. Requests to have tests made should be addressed to the "U. S. Experimental Model Basin, Navy Yard, Washington. D. C." Before tests are undertaken a certified check for the estimated cost of the work is required to be deposited.

Personal Pars

Herbert A. Munter has resigned from the Pacific Aero Products Company, of Seattle, to fill a string of exhibition dates in the West and Northwest.

Charles M. Peters has just purchased a specially built looping biplane, equipped with a 90 h.p. Gyro motor, for exhibition work. He will make his headquarters in Minneapolis.

Frank Castory will make flights at the Johnson County Fair, Iowa City, Iowa, August 8, 9, 10 and 11.

Attempting to turn while flying only about 20 feet above the waters of Muskegon Lake, Edward Powers ripped part of the planes off his machine, falling with his craft into the lake. The aviator clung to the machine for nearly half an hour before a launch was attracted to the scene by his cries for aid.

Charles Theodore made a number of flights in his Curtiss type biplane at the San Saba (Texas) fair last week.

Charles T. Mills, of the Howell Aviation Co., will fly at the county fair at Albert Lea, Minn., September 12 to 15.

Aviator O. W. Timm has concluded his trial flights in the testing of his newly constructed biplane and is now ready to begin on his exhibition flights on the fall circuit. He is to perform at Kellogg at the big picnic to be held there in the near future.

Word has been received at Sullivan, Indiana, that Doyle Ryan, a son of the Rev. Daniel Ryan, formerly pastor of the Methodist Church at Carlisle, is one of the members of the American aviation corps in the French army who have been decorated for bravery.

The Aero and the War

(Editorial in Louisville (Ky.) Times)

ALTHOUGH it is nineteen years since Samuel Pierpont Langley announced to the world that mechanical flight could be attained, it has been only twelve years since Orville Wright made the first successful flight in an aeroplane driven by engine power. He remained in the air on that occasion but thirty-six seconds. Yet his machine rose from the ground under the impulse of mechanical power and traveled a short distance, carrying a passenger, over the sand dunes at Kitty Hawk, N. C.

It took nearly 100 years to develop the automobile from the first steam coaches. The modern auto came into existence with the perfection of the gas engine, but at that its development was slower than that of the heavier-than-air flying machine, although its use is still infinitely greater.

It is doubtful whether the automobile, wonderful as has been its growth and enormous as is the use now made of it, has had anything like the influence on the history of the world that stands to the credit of the Wright invention. The war now going on in Europe would have been on a radically different plan; indeed, before this time it might possibly have been ended had it not been for the aeroplane, which has rendered most of the strategy of the past obsolete.

The scouts of the air are among the more important arms of the present war. On their work depends the work of the armies. Surprises and sudden shifts of troops unknown to the enemy, which were the resources of the great generals of other wars, are no longer possible. The face of the war has been changed and the history of the world affected by an invention which is but twelve years old.

The Sperry Gyroscope Company

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The Sperry Synchronized Drift Set is now included in the U. S. Army specifications for aeroplane equipment.

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Propeller Experiments

So many factors enter into the building of propellers that the work necessary to produce a proper design must of necessity be very extensive and decidedly interesting. A combination of torque, gyroscopic forces and rapid changes in the loading of both blades is experienced by all propellers when in flight, due to the velocity of attack of each blade varying, and because the axis of the propeller is by no means always along the line of flight.

It has been common knowledge that the rapid development of higher powered aeronautical motors was outstripping the designing and building of propellers strong enough to withstand the added strain subjected to them, but the very considerable experimental and research work which naturally followed such a situation seems in a fair way to have overcome such a problem at least propellers are now being made which successfully withstand their use on motors delivering well over 200 h.p.

The Curtiss Aeroplane Company has very recently completed a series of tests lasting over 500 hours, including many runs in actual flight, and the result has led not only to the building of blades which satisfactorily met the more difficult requirements, but much valuable information and data has been accumulated which is proving useful in the construction of propellers which must accompany even more powerful motors.

Their 300 h.p., 12-cylinder motors, for instance, are rapidly approaching the "immediate delivery" stage, and the propellers must be of unquestionable strength and proper design.

The main trend, in a few words, of these manifold tests and types of construction has been to eliminate these features in the blades which were, or tended to be, self-destructive when under heavy load. It was shown that a certain, and quite standard type of general make, exerted a twisting force when under high thrust which was caused by the improper location of the line of center of pressure. Finding the proper location for this center and also increasing the efficiency of the surfaces nearer the hub, which theoretically is the point of greatest efficiency, and at the same time augmenting the strength at this section has been satisfactorily accomplished, and the results have been far reaching enough for the company's stating that its own design and make shall hereafter be furnished with all of its motors.

Captain Willoughby Gets a Monster Tuna

Captain Hugh L. Willoughby, the aviation enthusiast, has returned from a week's stay at Block Island, where with other members of the Atlantic Tuna Club he engaged in fishing tuna and swordfish. He was in his power boat Sea Otter with his grandson and an engineer, and went out several days. He harpooned one swordfish, but as the tuna had not struck in as yet he was unable to land any of these fish with rod and reel. While at Block Island, however, Mr. Willoughby weighed a tuna which had been caught in a net tipping the scales at 695 pounds. This shows that these out at Block Island run larger than those caught on the Pacific coast, where they never exceed 300 pounds.

Personal Paragraphs

Miss Ruth Law made exhibition flights at the Fargo, N. D., fair last week.

(*Continued from page* 696)

assist in raising the machine from the surface of the water.

Construction is similar to the best practice of boat construction, all fastenings by countersunk brass screws.

Wing floats 6 ft. long, 16 in. wide and about 14 in. deep at the center. They are constructed similar to main pontoon. Bottom board extends 6 in. forward of the pontoon itself, presenting to the water a planing surface which lifts when afloat. For steering on the water a small fin is arranged on the outer side of each float. From these floats control wires run to the nacelle. Normally a spring holds the fin or rudder flat against the side of the pontoon, but when the control wire is pulled, the rudder swings outward, causing a resistance to the water on that end of the plane, and the machine swings to that side.

Power Equipment

Curtiss 19-100 H. P. motor is directly connected to a 9 ft. brass tipped Burgess propeller, which turns at 1,400 R. P. M. The radiator fits on the rear of nacelle, in just the opposite position it would occupy on an automobile. The cooling, however, has been found effective.

Gas capacity, 52 gallons, sufficient for a flight of about six hours. Gas is pumped from the main tank to an auxiliary tank by a G. G. pump located under the nacelle.

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VOL. III NEW YORK, AUGUST 28, 1916 No. 24

Aviation Fleet for U. S. Coast Guard Service.

AN aviation fleet for the United States Coast Guard is created by the Naval Appropriation bill, which has been passed by Congress and will receive the signature of President Wilson on August 22. The Coast Guard is to apply aeronautics to the saving of life and property at sea in a constant practical manner, and will develop the science of aerial navigation over the water and in communication with ships. It is believed that this will result in an aviation corps that will be very valuable if war should come, especially in spying an enemy approaching by sea.

The Naval Appropriation act authorizes the Secretary of the Treasury to establish ten aerial stations at such places as he shall select on the Atlantic, Pacific and Gulf coasts. It creates an aviation school, with an instructor and assistant instructor. It also provides for an increase in personnel by the addition of ten line and five engineer officers, and for an additional forty mechanicians. Officers and men on active aviation duty are to receive extra compensation of twenty-five per cent and also all allowances as are granted in the navy for such duty.

It is estimated that there will be twenty aircraft required, at a cost of $200,000; ten stations and necessary equipment, $75,000, making a total cost for equipment of $275,000.

For maintenance, the estimate of maximum annual cost, with equipment complete, is fifteen additional commissioned officers, $50,000; forty additional warrant officers and enlisted men, $53,000; two instructors, $7,000; upkeep and repairs, $25,000.

The original bill was drawn as a tentative proposition by Captain C. A. McAllister, chief engineer of the Coast Guard service. This was the bill introduced by Representative Montague.

The measure received the indorsement and active support of the Aero Club of America.

In the meantime Captain E. P. Bertholf, commanding the Coast Guard, had become interested in the scheme. An offer of the navy aviation school at Pensacola to take on two officers of the Coast Guard for instruction in aviation was accepted, and Second Lieutenant Elmer F. Stone and Second Lieutenant of Engineers Charles E. Sugden were assigned, and are now there.

The Curtiss aviation camp at Newport News, Va., had shown interest, and had offered facilities—aircraft, equipment and experts—to develop the possibilities of aviation over sea. Lieutenant Stone, first designated as observer, was replaced by First Lieutenant Norman B. Hall. Then the Sperry Gyroscope Company offered its gyroscope compass and aerial wireless for experimentation. Lieutenant Hall has since been engaged in developing this scientific mechanical part of the project.

Aero Club Committe Reports on Aerial Reserve Corps.

TO assist the War Department in organizing the Aerial Reserve Corps which was authorized by President Wilson on July 13th and for which Congres has allowed a very substantial appropriation, a Committee of the Aero Club of America, consisting of Messrs. Alan R. Hawley, President, Evert Jansen Wendell and Henry Woodhouse of the Board of Governors and Augustus Post, has been compiling information regarding the methods adopted by other countries and has paid a visit to Canada to investigate the method followed by the Canadian Government in getting the 450 aviators which they supplied to England in the past two years. The report follows in part:

"To get aviators Canada has followed the method adopted by the European governments. To get into the British Air Service, for instance, a man, after he has passed the physical examinations prescribed for aviation service, must go to an aviation school and take a preliminary course of training which costs between $400 and $600 and obtain the certificate issued under the rules of the International Aeronautical Federation, which is issued in each country by the National Aero Club. This certificate is essentially to show that the candidate has undergone the tests which show that he has the making of an aviation pilot. The actual training is to take place under the direction of Army aviators at Army aviation schools, the latter training requiring about six months of continuous practice.

"Canada has not in the past undertaken to continue the training of military aviators so when a candidate for the air service has taken the F. A. I. pilot certificate he goes to England and is admitted in the air service 'on probation' and is refunded the cost of his course of training. This probation lasts between one and two weeks, after which the candidate is either rejected or accepted. If accepted, he is sent to a military aviation school for further training which usually lasts six months and which includes the operation of different aeroplanes and practice in scouting, bomb-dropping, etc., and he is given a temporary commission of Second Lieutenant. After this period of training the candidate is graduated and receives his full commission of Second Lieutenant and is ready for service at the front.

"The Committee visited the Curtiss aviation school near Toronto, of which Mr. J. A. D. McCurdy, the veteran Canadian aviation expert is the head, and found about 50 students being trained there at the present time. Mr. McCurdy and Canadian authorities advised the Committee that it is the intention of the Canadian Government to train one thousand more aviators. The Committee believes that the Aviation Section of the U. S. Army, which has charge of organizing the Aerial Reserve Corps, can obtain best results by following European practice.

"The Committee feels that out of the 600 civilians holding the F. A. I. certificate or about to take the certificate not less than 200 will make desirable candidates for the Aerial Reserve Corps, so that if steps are taken immediately to organize the Reserve Corps at least one hundred of the candidates will be able to take a few weeks of training at the Army aviation schools.

"The law governing the organizing of the Aerial Reserve Corps provides that the members of the Reserve Corps will not be expected to serve more than two weeks each year without their consent excepting in time of threatened hostilities. As the Reserve was authorized to make up the deficiency of trained aviators in the Army, which has only about twenty aviators available for flying duty, Congress appropriated the amount needed to pay the salaries of 297 officers and 2,000 enlisted men needed for the Aerial Reserve Corps.

"The Army Appropriation Bill now being considered by the Senate carries an appropriation of $9,640,800 for the organization, equipment and maintenance of twelve aero squadrons for the twelve militia divisions either in the militia or from the regular Army reserve and the Aerial Reserve Corps. The Aviation Section of the regular Army, of which Colonel George O. Squier, is the head, has charge of the expenditure of these funds and of training the militia officers and the members of the Aerial Reserve Corps. In the past six months several hundred members of the National Guard of different States have applied for aviation training which the War Department could not give because it did not have funds. The present appropriation will make it possible for the War Department to train these National Guardsmen.

Therefore, it is expected there will be about 500 National Guardsmen and civilians ready to join the Air Service and be trained under the direction of the Army as soon as the appropriation becomes available.

"The Committee of the Aero Club of America also paid a visit to the aviation school at Buffalo where fifteen Harvard undergraduates have established an aviation camp and are taking a course of training. Altho they have only been there a few weeks, quite a number of the Harvard boys are almost ready to take their F. A. I. certificates and if the Army adopts the European method of organizing the Aerial Reserve Corps they will be able to join the Aerial Reserve Corps before going back to college.

"The Aero Club of America, its thirty affiliated Aero clubs and other organizations co-operating for the developing of our aerial defenses, have offered their co-operation to the Aviation Section of the War department which offers have been accepted by Secretary of War Baker and Colonel Squier.

"The aeronautical concerns which have aviation schools have offered the use of their schools free of charge to the Army and are willing to let the Army operate their schools at cost so as to assist in developing our aerial defenses. If the War Department avails itself of these offers, a dozen schools can be operated immediately under the direction of the War Department in different parts of the country, and the Aerial Reserve Corps and the twelve militia aero squadrons can be organized within the coming twelve months.

"Colonel Squier, the commanding officer of the Aviation Section of the Army, was the officer who drew the specifications for the first aeroplane which was acquired by the Army in 1908. In the eight years that have elapsed the Army has only succeeded in getting thirty officers for the Air Service, only about twenty of which are available for the operation of aeroplanes. Colonel Squier has been in England connected with the U. S. Embassy since 1913 and was recalled two months ago to take charge of the Aviation Section of the Army. On account of his knowledge of European practice it is expected that as soon as the Army Appropriation becomes available he will take energetic steps to co-ordinate all the resources available for the developing of aerial defences."

Orville Wright Proposed for Nobel Prize

IT has been suggested to us that a petition should be drawn up in favor of Mr. Orville Wright as a candidate for the Alfred B. Nobel $40,000 physics prize.

The Swedish scientist, Alfred B. Nobel, the inventor of dynamite, died in 1896, bequeathing his fortune, estimated at $9,000,000, to the founding of a fund, the interest of which should yearly be distributed to those who had mostly contributed to "the good of humanity." The interest is divided in five equal shares, given away, "One to the person who in the domain of physics has made the most important discovery or invention, one to the person who has made the most important chemical discovery or invention, one to the person who has made the most important discovery in the domain of medicine or physiology, one to the person who in literature has provided the most excellent work of an idealistic tendency, and one to the person who has worked most or best for the fraternization of nations, and the abolition or reduction of standing armies, and the calling in and propagating of peace congresses."

The prizes for physics and chemistry are awarded by the Swedish Academy of Science, that for physiological or medical work by the Caroline Institute (the faculty of medicine in Stockholm), that for literature by the Swedish Academy in Stockholm, and the peace prize is awarded by a committee of five persons, elected by the Norwegian Storthing.

In accordance with these statutes the awarders of the prizes (the four above named institutions) elect fifteen deputies for two consecutive years, the Academy of Science electing six, and the other prize awarders three each. These deputies elect for two consecutive years four members of the Board of Directors of the Nobel Institute, which board, exclusively consisting of Swedes, must reside in Stockholm. A fifth member, the President of the board, is nominated by the Government. The Board of Directors has in its care the funds of the institution, and hands yearly over to the awarders of the prizes the amount to be given away. The value of each prize is on an average $40,000.

It will not need a monument to make the names of the Wright brothers last far beyond our time, any more than Cæsar's name is kept alive by any such reminder. Think for one moment what their work was. Before those brothers set out to solve the problem which had baffled scientists for centuries, the people of this earth could travel either by land or by sea, but on restricted lines only. Now one may travel by air in any direction, regardless of whether the earth below be wet or dry, and thus a third and still more useful means of locomotion is at the service of mankind. This was only accomplished after methodical calculations based on original experiments, which resulted in the Wrights building a machine which flew for miles right away, and this under perfect control. Now that we know how this thing is done it seems so easy, but ten years ago the accredited crank was experimenting just as he had been a hundred years before, and as he might still have been a hundred years hence had it not been for the Wrights.

We are very apt to give all our praise to those skillful flyers who by their pluck and dexterity do such brilliant deeds to-day, but these splendid fellows are but the jockeys of the flying horse, which required to be born before it could be ridden. And in years to come when the records of these many flights are lost in a host of greater deeds, the people living then will look back and ask who was the originator of this great change. History will show how the two brothers, throwing over the data that impeded other experimenters, commenced again from the beginning, and gave practical shape to the dreams of centuries, and it will be then that we who talk or fly will be put upon the trial of our sense of justice and proportion.

We very cordially endorse the suggestion that the name of Orville Wright be offered as a candidate for the Nobel Prize.

A Lesson

A PRESS despatch printed recently read:

Air Raids in Egypt. Bombs Dropped by Turks on Kantara—Skirmishing in Quatia. London, June 12.—The following official communication concerning the operations in Egypt was made public to-night:

Hostile aeroplanes bombarded Kantara (30 miles south of Port Said on the Suez Canal) and with a machine gun fired on Romani yesterday. They were driven off by British aircraft with a few minor casualties at Kantara. No one was injured at Romani. There have been successful skirmishes with patrols on the eastern border of the Quatia district.

If this happened at the Panama Canal there would not be a single aeroplane to defend the great work of Goethals.

Song of the Seaplane

To do or die, I soar the sky,
 The seas beneath me flow;
Lord of the air, to do and dare
 And fight the ruthless foe.
For quick I steer, and I know no fear,
 Steadfast, true and free;
Over the land, guarding the strand,
 Over the silver sea.

With aid complete I help the Fleet,
 The submarine I spy;
With fiery breath the bomb of death
 Swiftly I hurl from high.
For quick I steer, and know no fear,
 Steadfast, true and free;
Over the land, guarding the strand,
 Over the silver sea.

CLYDE DANE in the *Sunday Pictorial (London)*.

The News of the Week

N. Y. Militia Fliers Ready for Border

The New York militia units which are next to go to the border are the 3d Heavy Field Artillery, formerly the 65th Infantry of Buffalo; the field train and the 1st and 2d Aero companies, all of which have been mustered into the federal service.

It is expected that the field train of 500 men in charge of the ammunition and supply wagons, now at Peekskill, will leave for the Rio Grande shortly. There are sixty men in each aero company which are in training at Mineola, L. I. The first company has four machines.

Miss Peary to Study Aviation

The North Pole may next be "discovered" from an aeroplane, the entire journey being made from the United States by that method of conveyance. And it may be a Peary at that who next sets eyes on the frozen apex of explorers' ambitions.

The daughter of Admiral Robert Peary, the first man to set foot on the small quantity of ice which marks the location of the North Pole, Miss Marie Anighto Peary, has announced her intention of learning how to operate an aeroplane. Her friends immediately began to ask themselves what the object of her ambitions might be in that direction. They reminded themselves that Miss Peary was born while her father, then Lieutenant Peary, was making his second expedition in search of the Pole. She was born in Greenland, and because of that fact she was given the middle name of Anighto, which is Eskimo for "Snow Baby." What more natural, say these friends of Miss Peary, than that she should want to learn to fly so that she may see the land the discovery of which brought such fame to her father?

Miss Peary herself has a different explanation for her desire to learn to navigate the air—she says she wants to be able to fly in order to help her father in establishing an aerial coast patrol with stations along both the Atlantic and Pacific coasts to protect the country against the possible invasion of an armed foe.

Her friends do not believe this purpose covers the entire ground of her ambition, however, and predict that the "daughter of the Arctic" will sooner or later attempt to penetrate the icy distances of the far north—even to the North Pole itself.

La Montagne to be Aviator

Harry La Montagne, the wealthy horse owner, has decided to leave Saratoga shortly for New York, whence he will go to France to join the French aviation corps. Consequently, Mr. La Montagne has ordered his entire stable of jumpers to be sold at auction here on August 24. Harry La Montagne, who is a well known polo player, is a brother-in-law of Professor Nicholas Murray Butler of Columbia University. At the beginning of the war all the horses he had in his stable in France were taken over by the Government.

G. C. Thomas, Jr., Makes Philadelphia-Atlantic City Trip

The new flying boat of George C. Thomas, Jr., son of a prominent banker, made the trip from Essington, on the Delaware, just below the city, to Atlantic City in an hour and forty-five minutes on August 15th.

Mr. Thomas was accompanied by Walter Johnson, instructor at the aviation school at Essington. He expects to make the trip in forty to fifty minutes when his machine is better tuned up. The distance is about sixty miles.

Mrs. Peirce an Air Pilot

Mrs. Waldo Peirce, of 23 East Ninth street, qualified yesterday as an air pilot, and will soon be the only licensed amateur woman pilot in this country. She passed all the flying tests, both alone and with passenger, at the flying field near Mineola, and will receive her license as soon as the official reports are passed by the License Committee of the Aero Club of America. Mrs. Peirce is a daughter of the late Isaac L. Rice, the inventor. Her husband is now with the American Ambulance Corps in France. She will soon take the tests for the military aviator's license, and when she receives that certificate will be the only woman aviator in the country qualified to fly for the United States Army.

Allied Aeroplanes in Florida Waters

The French cruiser Admiral Aube, which was recently at Pensacola, and other allied cruisers are keeping a close watch over Florida ports for the arrival of the German submarine Bremen, which is said to be waiting for a chance to come into some Gulf port.

During the last week no fewer than a dozen aeroplanes have been sighted at various places along the coast, all of them flying low and evidently making observations at harbor entrances. At Punta Gorda, St. Petersburg, Tampa, Tarpon Springs, and other points these machines have been observed. Observers at St. Petersburg said the aircraft had flown over American territory, which is a violation of neutrality. Machines are now sighted daily and seem especially watchful at night.

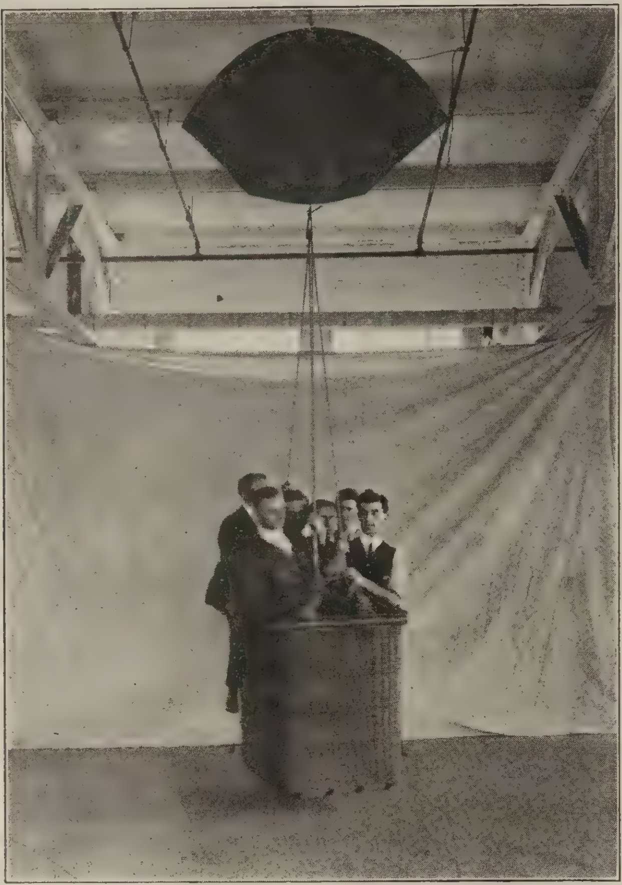
Sperry Company Developing Searchlight

A searchlight, capable of developing 1,280,000,000 candle power, is being erected atop the new Sperry Gyroscope Company's building on Flatbush avenue, Brooklyn. It is promised that the light will be the most powerful in the world, exceeding by 60 per cent the powers of the one recently tried out at the Brooklyn Navy Yard, with which it was reported objects could be plainly seen thirty-five miles away.

Elmer A. Sperry, designer and supervisor of the light, said that it was for experimental purposes only.

"In case of need, however," he added, "the light could be used against any enemy of the country that swims, flies or walks."

These men comprise the entire body of American Aviators now actually flying on the French front. In the group, left to right, are: Lieutenant de Laage, Sergeant C. C. Johnson, New York City; Corporal Lawrence Rumsey, Buffalo, N. Y.; Sergeant J. R. McConnell, Carthage, N. C.; Lieutenant William Thaw, Pittsburgh; Sergeant R. Lufbery, New Haven, Conn.; Sergeant Kiffin Rockwell, Atlanta, Ga.; Adjutant Didier Masson, Los Angeles, Cal.; Sergeant Norman Prince, Boston; and Adjutant Bert Hall, Galveston, Tex. [Photo Courtesy N. Y. Times.]



Testing a kite balloon patch at the factory of the Goodyear Tire and Rubber Co., Akron, Ohio.

Harry Fox Joins Flying Yacht Club

Harry Fox, the moving picture actor, who recently took up aviation as a sport, has become a member of the New York Flying Yacht Club. In a letter addressed to J. C. Mars, the acting president of the club, Mr. Fox expressed his intention of going in for aviation in earnest, not only as a sport but to perfect himself in the art of flying so that he may offer his services to his country as an aviator in case he is needed.

Mr. Fox, who is playing the star part in "Beatrice Fairfax," the remarkable photoplay series of the International Film Service, Inc., came down from Ithaca where the films are being made, to make arrangements for joining the new aviation club. He will attend the aviation luncheon to be given on August 31. More than one thousand persons are expected to attend, among them Rear Admiral Robert E. Peary, Vincent Astor, Glenn H. Curtiss, Lawrence Sperry, Harry Payne Whitney, Harry Burgess, President Alan R. Hawley, of the Aero Club of America; Henry Woodhouse, G. Douglas Wardrop, Augustus Post and others. Addresses will be made by Rear Admiral Peary, President Hawley, Mr. Woodhouse, Congressman Murray Hulbert and H. M. Davison.

Willie Ritchie Joins Aerial Reserve Corps

Willie Ritchie, ex-lightweight champion, has added to his accomplishments by qualifying for appointment as first lieutenant of the Aviation Reserve Corps of the United States army.

Combining knowledge of mechanics with the faculty to study, the San Francisco glove artist successfully passed the term of aviation instruction at the military encampment just brought to a close at Monterey, Cal. He ranked fourth among the members of the northern forces in the final examinations.

Tests were held in aviation theory and practical mechanics. Willie led the field in the practical work, but fell down slightly in his written tests. But he pulled up at the finish with an average of 91¾. Tod Ford, the Pasadena millionaire polo player, ranked first.

The northern squadron of the Aviation Reserve Corps is under charge of Captain William Mayer of Berkeley. Ritchie is second in command. These officers will keep in touch with the other members of the squadron in the coming year to promote the affairs of their service.

Burgess News

Tests on a new Navy Seaplane are now under way by the Burgess Company. This machine is somewhat similar to that built for the Navy and tested last January at Pensacola.

It is a biplane of the Dunne self-balancing type, and is designed to be the fastest over water aeroplane ever constructed. Its power plant is 140 horsepower Sturtevant, driving a specially designed propeller. With this a speed, in unofficial trials, of 81 miles an hour has been attained.

Another Navy screw aeroplane of the tractor type is also being tested there. These machines, instead of being shipped to the Navy Aeronautical Station at Pensacola, will be retain until the arrival of the U. S. Cruiser North Carolina, which is expected at Marblehead within the next few days. The North Carolina, as is generally known, has been detached from the Atlantic fleet units as a mother ship for naval aeroplanes. On her arrival the official trials of the new navy war seaplane and the screw machine will take place.

J. Brooks Clarke New President M. F. P. Sales Corporation

Mr. I. Brooks Clarke has been elected to the presidency of the M. F. P. Aero Sales Corporation in the place of Mr. Walter L. Fairchild, resigned. The offices of the corporation are now at 165 Broadway.

Kansas News

Capt. Phil Billard has asked J. Will Kelley, secretary of the Topeka Commercial Club, to call a meeting of the board of directors for the purpose of deciding whether the organization will be willing to raise $3,000 to defray the expenses of the organization of an aviation company in Kansas. An aeroplane being made by A. K. Longren will be completed ready for testing within a week. Meantime an endeavor is being made to select members for an aviation company. Such a company will comprise twenty-nine men, including six officers, four of whom must be licensed pilots before the company gets under the protecting wing of the United States government.

Topeka, commercially, may prosper as a result of the organization of the company, Captain Billard has told Commercial Club members. The aeroplane now under construction by Longren will be used by Captain Billard in training officers, preparatory for their examination for a government license as pilot.

Eastern School of Aviation Active

Flying instruction is given daily and Sunday between sunrise and sunset by the Eastern Aeroplane Company, Inc., conducting the Eastern School of Aviation at the Sheepshead Bay Speedway.

Students are taught to fly on a dual wheel control Eastern tractor biplane, equipped with 120 h.p. Maximotor. The ground work practice is given the student on a monoplane. The course of flying requires about six weeks to complete, ending after the student has qualified successfully for aviator's license issued by the Aero Club of America.

Frederick C. Hild, licensed aviator No. 216, is the instructor and secretary of the company.

Detroit News

Barton L. Peck had his Curtiss flying boat out on August 10th for the first trip of the season, and experienced some trouble with the extremely high wind which came up on Lake St. Clair shortly after he had started. When he made a landing about twenty miles up the lake, the wind blew the plane against a breakwater and broke the end section of the plane and badly damaged the pontoon.

Leonard Bonney, flying the General Aeroplane boat, has been carrying a large number of passengers in the last month. He is also teaching four students.

O. E. Williams was in Detroit Wednesday and did some very nice work with the Maxi Flying Boat.

Howard S. Borden to Commute by Air

Howard S. Borden, whose latest sporting fad is aviation, confidently expects to fly between his country home at Oceanic, N. J., and his New York office before the summer is over. Notwithstanding the fact that he was very ill so recently as last spring, he is soaring to the clouds in search of laurels in the hydroaeroplane world and at the same time astonishing and interesting the denizens of Atlantic Highlands by his daring flights. Like Harry Payne Whitney's machine, his is a Burgess-Dunne and it can make seventy miles an hour without turning the proverbial hair. Years ago Borden caused considerable amusement to the commuters to the Jersey coast by speeding his power craft, *Sovereign,* around and around the Sandy Hook steamboats. As the latter average only about twenty miles an hour, the turbine engines of the 165 footer *Sovereign* had little trouble in developing a far greater speed.

Taylor to Investigate European Engines

Cecil Hamilton Taylor, consulting engineer on the staff of the Republic Motor Truck Company and also of the Curtiss Aeroplane Company, left last week on the American Line steamer for England and France.

Mr. Taylor will confer with aeronautical engineers of Great Britain and France and conduct an investigation into aeronautical developments among the warring nations. He will give especial attention to motor development.

The war has developed aeronautics twenty years in as many months, and Mr. Taylor, with his wide experience and knowledge of motor developments along both automobile and aeroplane lines, should return with much valuable data for American manufacturers of aeroplanes.

Lewis Hydro to be Tested

Manufacturers of the new inherently stable hydroaeroplane which was invented by Harry S. Lewis and a party of his friends, at Tampa, Fla., last winter, will begin in a few weeks at Toronto, Can.

Mr. Lewis is the promotor and owner of all of the patent rights to the new machine. Absolute secrecy was observed while the party was on Old Tampa Bay.

Grinnell Co. Reorganization Planned

Stockholders in the Grinnell Aeroplane Co. are considering a proposition from an outside concern to take over the present organization, double the capital stock and proceed with the manufacture of the Robinson biplane.

Aeronautical Course at University of Illinois

The University of Illinois in its division of mechanical engineering has provided for a professorship in aeronautics to study the flying machine in all its different aspects. Elisha N. Fales, of Buffalo, N. Y., has been appointed assistant professor of aeronautics.

Censorship on the Border

The army headquarters have handed to the correspondents on duty on the Mexican border a memorandum on the censoring of press messages filed for telegraphic transmission at Columbus, the main base of the punitive expedition. The memorandum provides that all news or comment is prohibited in regard to the following subjects:

"Everything pertaining to the operation of the aero squadron or any of the aeroplanes, their condition, numbers or intentions with regard to reconnoisance flights or the result of flights.

"Information concerning the location of headquarters of the expedition or of any organization or movements of troops.

"Criticism of any department or corps."

It says that decisions of the censoring officer may be carried in an appeal to the commandant to the base.

Planes Tested in Open Gulf

To determine the sea weathering qualities of the navy planes, tests have been commenced in the open gulf at Penascola with aeroplanes and the destroyer Roe. A Burgess-Dunne, piloted by Lieutenant Whiting, was allowed to withstand the buffetings of the waves for several hours on August 8th.

Personal Pars

E. B. Lopp, a Miami, Oklahoma, aviator, flew at the Old Settlers' Reunion at Columbus, Kansas, August 15 to 18.

C. O. Crest, instructor at the Venice (Cal.) School of Aviation, fell on August 2, while making the third of a series of loops.

A heavy headguard prevented serious injury from the fall of more than 100 feet. Crest's nose was broken and his face cut, but he did not lose consciousness.

Top insert, George Gunndy, president Staten Island School of Aviation; lower left, C. Ray Benedict, instructor; and two views of the Benoist school machine.

WING DOPING IN AEROPLANE CONSTRUCTION

By Gordon F. Smith
Signal Corps Aviation School at San Diego, Cal.

Summary: The following conclusions are drawn from the doping methods that are used at the present time. Almost every material that could be used for aeroplane covering has been tried by all the large aeroplane manufacturers in this country and in Europe.

Materials Used: Fabrics have been adopted because of their lightness and stretching qualities, unbleached linen cloth having been chosen for this purpose. Linen is a cloth made of flax. The grade, unbleached linen, high and medium grades, weigh from four to four and three-quarter ounces per square yard, and is imported from Europe.

As the linen fabric must be treated for air tightness, water proofing, shrinkage and durability, it was a question for the varnish, rubber and chemical companies to answer.

One of the first large firms to work out this question was the Farben fabriken Varm Friedr. Bayer & Co., of Elberfeld, Germany.

When the European war began, it cut off the supply from Germany. To supply our own needs in these goods, two of our large American firms have taken up the task and are turning out a mixture which is proving successful for this purpose. The base of this specially prepared goods, at the present time, is on the cellulose base, with more or less softening material added, being dissolved in some suitable solvent.

Preparing sections before covering: The wings, etc., before covering should be varnished with three coats of good spar varnish which protects the glue from dampness, preserves the wood, etc. If steel is used in the construction, two coats of fine lead paint with one coat of spar varnish will protect the steel from corrosion.

Shellacs have proven unsuccessful for this work as it does not protect the glue or wood from dampness, and also deteriorates the linen fabric when cellulose base dopes are used. The solvent in the dope penetrates the fabric, recutting the shellac gum, which makes the softened shellac soak through the fabric, causing the places affected to rot and look unclean.

Covering: The best way to attach the cloth to the sections is by sewing. Nails and tacks weaken the sections by splitting the wood.

The best results are obtained by laying out and sewing cover diagonal to the section which is to be covered, and by exercising a little care, the waste in fabric is not greater in this method than by laying the cloth on straight.

When the linen is attached to the wing sections, etc., and doped with cellulose base dopes, care must be taken not to stretch the cloth too tight. In damp weather, the cloth must necessarily be stretched a little tighter than in hot, dry weather. A good plan is to sew the cloth and then hang it up by one edge so that all the wrinkles are stretched out, and then stretch it just taut on the wings, etc.

Applying cellulose base dopes: By using cellulose base dopes, it has been found that the best results are obtained by having a clean, warm, dry room, excluded from the remainder of the department, with ventilating openings in the floor to let out the poisonous vapors, which, being heavier than the air, float close to the floor.

Open doors, windows, etc., causing a draft will effect the dope by causing it to turn a whitish hue, in streaks and spots. The reason for this is that the air has a chemical effect on the present cellulose base dopes.

Doping out of doors on warm days has been proven to be successful.

When applying cellulose base dope, the first two coats should be applied lightly. The idea is to merely fill the pores of the fabric. If the first two coats are applied too heavy the result is that the dope soaks through the fabric, drops through to the under surface causing spots.

Good results can be obtained by applying five coats of cellulose base dope, without using spar varnish for a finish.

Best results have been obtained by applying seven coats of cellulose base dope and three coats of good spar varnish, this for a fine smooth finish.

The application of a good spar varnish helps to preserve the doped surfaces from dampness and rain.

Nothing is to be gained by sandpapering the doped surfaces between each application of dope. This means unnecessary amount of labor and injures the fabric. Each coat of cellulose base dope applied dissolves the one applied previous, so that no matter how many coats are applied you have only one layer or sheet of special formed celluloid.

Good results are obtained by sandpapering, very lightly, between coats of spar varnish, being careful not to injure the surfaces where the fabric is stretched tight over the ribs, etc.

If cellulose base dopes are desired to be colored, best results are obtained by adding liquid dyes which contain no solid bases.

Cellulose base dopes require from twenty to forty minutes to dry, between coats, depending on weather conditions.

Doping should not be done on rainy days, as the dampness contracts with the linen. The result is that the dope will not set properly.

Artificial heat is not satisfactory in trying to apply dope on damp days. The heat forms steam and moisture which tends to contract with the dope and fabric.

Cellulose base dopes can be used as a cement for patching damaged surfaces, provided the spar varnish is removed from the spot to be patched. A good varnish remover should be used for this purpose.

The efficiency of cellulose base dopes has been proven to be superior, for aeroplane construction, to oil, gum and rosin dopes. This from the point of practical experience.

Transparent covering has not been tried in this country for our government machines, due to the fact that they do not come up to the requirements for this purpose.

The base of the German and French transparent covering is cellulose base, pressed out into sheet form, of almost the same transparency as glass. It will not crack or splinter, and has the toughness and pliability of rubber.

In this country we have tried all the mottled effects, etc., for rendering aeroplanes invisible, but with very little success.

In the very near future I predict a change in cellulose base dopes for aeroplane covering, not as to durability but principally in fireproofing.

Aerial Research

The Report of the National Physical Laboratory, London, for the year ending March 31st last, just issued, shows incidentally how useful the institution has been in the war.

Research in aeronautics is a branch in which there has been great activity. The naval and military representatives on the Advisory Committee for Aeronautics urged the need of additional windchannels, to enable the data required for design to be obtained more rapidly. It was decided that one additional 7 ft. and one 4 ft. channel were desirable, and the work of construction was started in November last. At the date of the report the buildings were finished and the equipment was nearing completion.

Much research work has been done for the Ministry of Munitions, including the Munitions Inventions Department, and for the Board of Invention and Research. At the request of the Ministry the Laboratory undertook the testing of gauges required in the manufacture of fuses and shells, a special staff being organized for the purpose.

The Laboratory has also done its part in helping to meet the deficiencies in British industries revealed or caused by the war. During the year help was given to a number of firms who have undertaken the manufacture of goods formerly obtainable only from German sources, and it is satisfactory to learn that in several directions the efforts of those firms have been successful.

In spite of the vacancies in the staff caused by enlistment, it was half as large again in April last as it was a year ago. A number of voluntary assistants have given their services, and the work of 47 women has been very efficiently done.

Personal Pars

Ten thousand persons at the Lincoln Park golf links watched Louis Gertson of San Francisco, August 15, as he performed daredevil stunts in his aeroplane. With his machine outlined by lights, he flew and circled and evoluted, and ended by looping the loop four times.

Charles M. Peters sustained a broken leg on August 9th, while testing a biplane with which he contemplated making exhibition flights. He is in Asbury Hospital, Minneapolis.

FOREIGN NEWS

AUSTRIA

Austrian airmen are keeping up their active bombardment of Italian positions on the mouth of the Isonzo and in the neighboring territory. An Admiralty statement from Vienna on the 15th of August says:

"Austro-Hungarian naval aeroplanes on the night of August 12 bombarded most effectively hostile batteries at the mouth of the Isonzo, the aeroplane station at Borgo and aerial plants near Monfalcone. The airships returned undamaged in spite of the most violent shelling."

"Up to August 11 Austro-Hungarian naval aeroplane squadrons bombarded extensively the arsenal, railroad station, outer works and the outer forts of Venice," says an official statement issued in Vienna. "Good successes were obtained despite a thunderstorm and rain. Fires were seen in the arsenal and railroad station."

A despatch from Rome under date of August 12 said that the historic church of Santa Maria Formosa in Venice had been destroyed during an Austrian air raid over that city on the night of August 10.

"An Austro-Hungarian naval aeroplane squadron on the night of August 9 carried out a most successful bombardment upon a hostile battery at the mouth of the Isonzo and the hostile naval aeroplane station at Grado," says an Austrian Admiralty statement issued on the 17th of August.

Further operations of Austrian airmen in bombarding positions behind the Italian front in the Isonzo region are recorded in an Austro-Hungarian statement issued on August 16th. The statement follows:

"On the night of August 13-14 a naval aeroplane squadron bombarded most successfully the railroad station at Ronchi and military objects and positions in Chetre-Vermegliano, Selz and San Canziano and a hostile battery at the mouth of the Isonzo."

Aug. 19.—Two air raids, one by Austro-Hungarian flyers over Avalona, Albania, and the other by French airmen over Trieste, were reported to-day by the Admiralty. The latter precipitated a spectacular battle at 3,000 feet altitude.

Lieutenant Banfield, the most valiant airman in the Austrian service, forced down two of the machines that took part in the Trieste raid.

The official report follows:

"On the night of August 15 Austro-Hungarian naval planes attacked Avalona. Direct hits were obtained on coast batteries, barracks, camps and shipping in the harbor. Numerous conflagrations occurred. In spite of violent shelling, all the machines returned safely.

"On the morning of the 14th, seven hostile naval planes, mostly French, protected by three French fighting planes and by hostile torpedo boats and patrol boats, attacked Trieste.

"Our aeroplanes ascended to give battle. Lieutenant Banfield forced an enemy aeroplane, during a fight, to descend in the middle of the Gulf of Trieste. The inmates were probably drowned. Lieutenant Banfield then pursued another aeroplane, which was also precipitated to earth in battle, falling near Miramara. The inmates were killed. The aeroplane 'F B A No. 308' was brought in totally smashed.

"The hostile fliers dropped several bombs on the port (Trieste) without doing any damage worth mentioning. As far as known two persons were killed and two wounded."

FRANCE

On August 15th German aeroplanes conducted a raid on Belfort. There were no casualties. French aviators bombarded concentrations of the enemy at Nicolic and Volevec and the military works at the St. Retmica Station. Enemy aeroplanes bombarded an ambulance at Vertekoi.

Funeral services for Dennis Dowd, the American who was killed while in training for the French aeroplane corps were held at the American Church in Paris on August 15th. The services were attended by several of the Americans in active service with the French Aeroplane Corps as well as many members of the American Colony in Paris. The French authorities were represented by Commandant Pegar of the Buc aviation school and by Captain Kleindienst, who is in command of the American detachment at Buc.

Aug. 19.—Sub-lieutenant George Guynemer of the French Flying Corps, whose exploits have won him a reputation as one of the most daring of French aviators, is again mentioned by the War Office in to-day's statement. On August 18 he shot down his fourteenth adversary.

The announcement follows:

On the Somme Second Lieutenant Gynemer brought down on August 17 his thirteenth aeroplane and yesterday his fourteenth, which fell between Bouchavesnes and Clery.

On August 17 Second Lieutenant Haurtetux also brought down a German machine, making the fifth which this pilot has brought down up to the present time.

GERMANY

The German Government has recently issued a White Book in which it claims that the Zeppelin raids over Great Britain are purely in the nature of reprisal. Part of the substance follows:

"Of course the Government has declined to respond to the crimes committed by the British seamen by carrying out similar reprisals—for instance, the shooting of British prisoners of war. But German airships will convince the English people that Germany has the means of preventing from going unatoned the cruelties of the officers and crew of the Baralong."

The German reply points out that formerly particular consideration was given, in employing Zeppelins for military purposes, to the civilian population, although there was unavoidable danger to civilians, but said that in view of the Baralong incident a different attitude would be adopted. The Government's purpose is quoted as follows by the News Agency:

"Airships will be used against England within the limits of the law of nations, without any other regard. Every airship which throws destructive bombs on London or other defended towns or on towns which contain establishments of a military character shall cause England to remember the Baralong case."

A recent announcement by the German War Office gives the following list of the ten most successful of the German aviators with the number of machines brought down by each:

Captain Bölke, 19; Lieutenant Immelmann (dead), 15; Lieutenant Wintgens, 11; Lieutenant Höhndorf, 10; Lieutenant Parchau (dead) 8; Lieutenant Mulzer, 8; Lieutenant Baron von Althaus, 8; Lieutenant Leffers, 5; Lieutenant Walz, 4, and Lieutenant Gerlich, 4.

On August 13 several German naval aeroplane squadrons again attacked Russian aircraft stations at Papenholm and Lebara, on Oesel Island, and obtained good results. Notwithstanding the heavy fire of Russian anti-aircraft and naval guns, all the German machines returned undamaged to their base.

Aug. 18.—"A French biplane was forced to descend on Wednesday, near Nesle, by our anti-aircraft guns."

East of the Bapaume a British aeroplane was compelled to make a landing after an aerial encounter.

GREAT BRITAIN

Captain (temporary Major) Lionel Wilmot Brabazon Rees of the Royal Artillery and the Royal Flying Corps received the Cross for a battle against great odds while flying over the enemy lines.

"For conspicuous gallantry and devotion to duty," his award reads:

"While on flying duties, Major Rees sighted what he thought to be a bombing party of our own machines returning home. He went up to escort them, but on getting nearer discovered they were a party of enemy machines, about ten in all.

"Major Rees was immediately attacked by one of the machines, and after a short encounter it disappeared behind the enemy lines, damaged.

"Five others then attacked him at long range, but these he dispersed on coming to close quarters, after seriously damaging two of the machines. Seeing two others going westward, he gave chase to them, but on coming nearer he was wounded in the thigh, causing him to lose temporary control of his machine. He soon righted it, and immediately closed with the enemy, firing at a close-contact range of only a few yards, until his ammunition was used up.

"He then returned home, landing his machine safely in our lines."

Private George William Chafer, East York Regiment, delivered dispatches, which he had taken from a wounded bearer, under severe fire and although wounded. His record reads:

"For most conspicuous bravery. During a very heavy hostile bombardment and attack on our trenches a man carrying an important written message to his company commander was half buried and rendered unconscious by a shell. Private Chafer, at once grasping the situation, on his own initiative took the message from the man's pocket and, although severely wounded in three places, ran along the ruined parapet under heavy shell and machine gun fire and just succeeded in delivering it before he collapsed from the effect of his wounds. He displayed great initiative and a splendid devotion to duty at a critical moment."

The following is from the official report of August 15th:

"Our flying corps carried out much successful work, acting with our artillery and infantry. Several bombing raids were made including three separate attacks on a hostile aerodrome. One of our machines is missing."

A report dated August 17th, relative to successes of the British on the continent, reads:

"Yesterday a German aeroplane was brought down aflame in our trenches after an air combat, and a second machine by our anti-aircraft guns. Enemy billets have been successfully bombed at various places by our aircraft."

Aug. 19.—British naval aeroplanes raided German ammunition stations at Lichtervelde, in Belgium, thirteen miles southwest of Bruges, yesterday, the War Office announced to-day.

"At noon yesterday a successful attack was carried out by naval aeroplanes on enemy ammunition dumps at Lichtervelde," the statement says. "Forty-eight bombs were dropped from a height of about 3,000 feet. Large fires were afterwards observed. All the machines returned safely."

The London Daily Express features an article by its naval expert on "Our New Zeppelins," dated August 19th, which says:

"During the past week I have watched the great British airships at work and, although I am unable to make practical comparisons with the German Zeppelins, our new airships certainly seem marvelously rigid and beautifully designed. Mariners, who have made close observations of German dirigibles, consider our new airships capable of being handled more readily, of finer model and altogether less cumbersome than the German type.

"The British airships, moreover, attain an amazingly high speed."

ITALY

A squadron of French and Italian aeroplanes made a raid near Trieste on August 15th, and it is reported that considerable damage was done. One French aeroplane was lost. The official statement follows:

"A squadron of Italian hydroplanes, together with French hydroplanes and aeroplanes, bombarded the munitions factories and hangar at Muggia, near Trieste, causing numerous destructive fires. The French lost one aeroplane while resisting those of the enemy. Otherwise the entire Franco-Italian squadron returned safely to its base."

Muggia is an Austrian seaport, five miles southwest of Trieste. It is on the Gulf of Trieste and has an excellent harbor for warships.

RUSSIA

The following report of engagements in the air was given out by the War Office on August 15th:

"On the evening of August 14 a German albatross appeared over the town of Nesvij. Staff Capt. Kruten, who brought down an enemy aeroplane at Nesvij on Saturday, ascended with his machine which is armed with a machine gun. He engaged the hostile aeroplane and drove it to earth in the vicinity of Nesvij. The pilot, who was wounded, and the observer were captured.

"On the Baltic Sea on Monday morning our Aviation Lieutenants Deterichs and Prokofeiev undertook with two hydroplanes a daring raid on the enemy's aerodrome near Lake Agern, in Courland. Notwithstanding a bombardment by anti-aircraft guns and a counter-attack by seven German machines, our aviators not only dropped bombs successfully on the enemy's sheds, but boldly entered into an unequal fight, which lasted more than an hour. Many bullets struck our machines, but happily not in vital parts. As a result of the fight, one of the enemy machines was struck and turned over in the air, falling to the ground enveloped in smoke. Two others alighted on the sea, having received injuries. Our hydroplanes returned safely to their base."

Aug. 17.—"A Zeppelin dropped bombs on the region of Kammern, directly west of Riga."

A report from Petrograd on August 19, states that in the region of the little town of Sokul an enemy aeroplane dropped more than seventy bombs.

EXPERIMENTS ON A DIHEDRAL ANGLE WING

By J. C. Hunsaker and D. W. Douglas

FOLLOWING up experiments by Rossell and Brand, showing the effect on the lateral stability of sweeping back the wings of an aeroplane, additional tests have now been made to determine whether the righting moment given by the above procedure cannot be better obtained by another method. To this end a brass model 18 inches by 3 inches having curvature, known as R. A. F. 6, was made identical in every way with the straight wing tested by Rossell and Brand, except that each half of the wing was inclined upwards and outwards 2½ degrees from the horizontal. This gave a dihedral angle upward of 175 degrees. The use of this amount of angle has come into general practice in aeroplane design.

The wing was mounted horizontally on the balance, and forces and moments were measured for angles of yaw of 0, 5, 10, 15, 20, 25 and 30 degrees to right and left and at angles of incidence of 2, 4, 6 and 9 degrees. The velocity of the wind was kept constant at 30 m.p.h. standard air. The method of manipulating the balance to make the necessary measurements is described fully in Report 68, Technical Report of the Advisory Committee for Aeronautics, 1912-13 (London). The calculations, from the measured forces and moments, to obtain the final results, were made as is outlined in the preceding report on Swept Back Wings, by Rossell and Brand (page 61).

The axes along and about which the calculated forces and moments act are as follows:

OX—Longitudinal axis coincident with chord at middle section.

OY—Transverse axis of wing, perpendicular to *OX*.

OZ—Normal axis of wing, perpendicular to *OX* and *OY*.

The origin *O* is the intersection of the axis *OX* with the leading edge of the wing.

The forces are:

X—Acting along *OX*, positive when in direction of wind.

Y—Acting along *OY*, positive when tending to increase side slipping to left.

Z—Acting along *OZ*, positive when acting upwards.

The moments are:

L—Acting about *OX*, rolling moment, positive when wing tends to take proper bank for turn to right.

M—acting about *OY*, pitching moment, positive when wing tends to stall.

N—acting about *OZ*, yawing moment, positive when wing tends to turn to right away from wind.

In figure 34 we can see the changes of the forces *X*, *Y*, and *Z* with yaw and incidence. It will be noted that *Y* is plotted to a scale of ordinates ten times greater than *X* and *Z*. This force, although negative and hence acting to resist a side slip, is so small in magnitude that it is negligible. *Z* falls in magnitude with increase of yaw angle as is to be expected, and as was the case with the swept back wings.

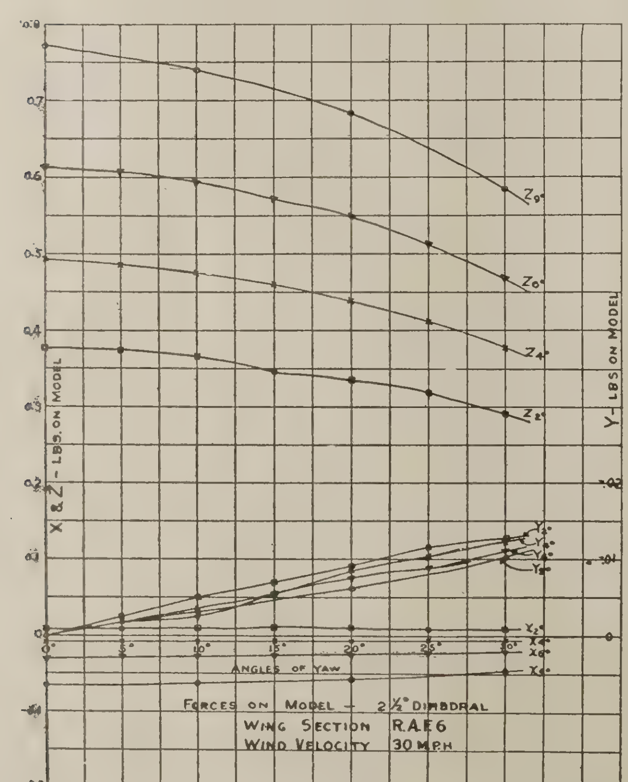


Fig. 34.
Subscripts designate angle of incidence

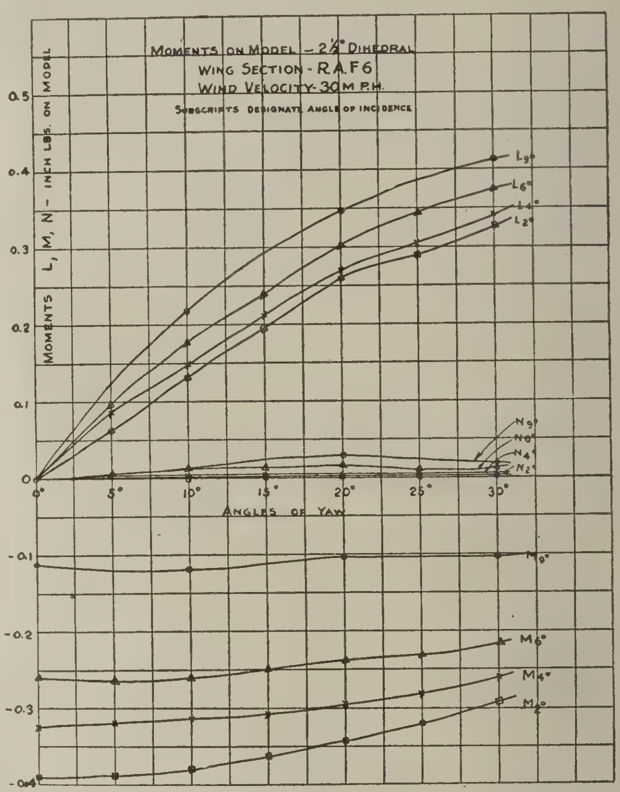


Fig. 35.

Figure 35 shows the moments on the wing. *N*, the yawing moment, is very small and does not change appreciably with the incidence of the wing.

M, the pitching moment, shows at the smaller angles of incidence a tendency for the machine to stall in side slipping. At the larger angle of incidence of 9 degrees, however, this stalling tendency disappears. This is a good feature, as it shows that the wing should not get into a bad stalling position when side slipping. The dihedral angle seems in this respect superior to the swept back wing, which has a stalling tendency at all incidences.

The curves for rolling moments, *L*, show for all incidences a rolling moment which increases rapidly with angle of yaw and with the incidence. This moment is a natural banking moment, and hence is one which is favorable for lateral stability. Comparing the rolling moments curve at 6 degrees incidence, for a normal wing, with the dihedral curve, it is seen that the magnitude is from two to three times greater in the case of the dihedral. Comparing this same dihedral rolling moment curve with those for the swept back wings (fig. 29), it is seen that the dihedral gives a rolling moment of magnitude about equal to that obtained with 20 degrees swept back wings, except at a large angle of yaw.

As it is much more difficult structurally to build a 20 degree swept back wing than a dihedral, and as the latter is as affective, it seems that the dihedral is of more value for purposes of lateral stability.

It is of interest to note in this connection that Professor Langley's "aerodrome" of 1902, as well as his previous power-driven models, were given dihedral angle wings inclined upwards by about 6 degrees.

THE BERKSHIRE MAGNETO

THE new magneto made by the Berkshire Magneto Co. will receive its initial test on aviation work when it is installed in the Glenn L. Martin aeronautic motor.

One of the principal claims made for this instrument is that while it gives a strong spark at low speeds and thus insures easy starting, the fierceness of the discharge increases at a lesser rate than the speed. It is, of course, possible to have too hot a spark. If the high speed discharge is very intense it has a destructive action on the points of the spark plug and the breaker points and puts an undue strain on the condenser and insulator.

Owing to the peculiar magnetic circuit of the Berkshire instrument it is claimed that the discharge current reaches one-half of its maximum amount of 50 r.p.m., while at 150 r.p.m. it has attained 80 per cent. of the maximum intensity. This means that the spark produced at 150 r.p.m. is practically identical with the spark at 3,000 r.p.m. or over.

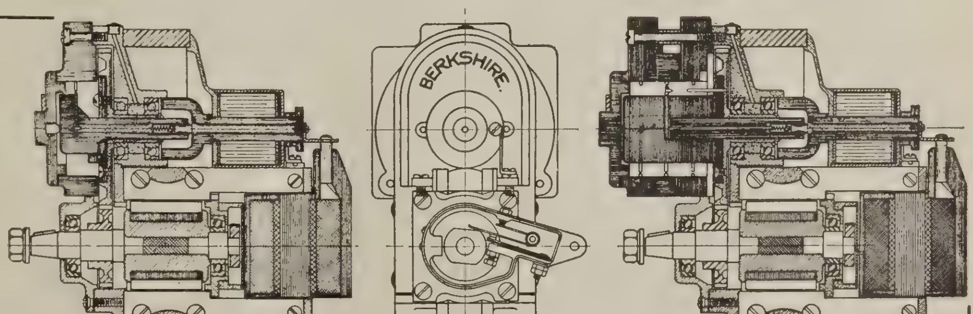
The reason for this action is not easy to explain, but some idea of the action may be obtained when it is stated that the magnetic circuit in the instrument is such that increasing magnetic flux caused by increasing speed meets with an automatic opposition. The action may be likened to that of the endeavor to force water through a length of pipe. The resistance to flow through a small pipe is such that above a certain speed the amount of extra pressure required to increase the flow is very great indeed. Another way of regarding it is to think of an electric condenser which can only hold a certain amount of electricity. With any condenser there is a limit of charge which cannot be exceeded. Similarly in the Berkshire magneto an increase in speed of 2,000 per cent. increases the flux through the armature by only 25 per cent.

In the Berkshire magnetos there are no windings, either low tension or high tension, on the armature. In fact, the only revolving member which carries electric current is the internal portion of the distributer. The horseshoe magnet has two poles and two supplementary poles of soft iron are placed in the mouth of the horseshoe, being magnetically insulated by aluminum. In the transverse section drawing of the instrument it can be seen that there are four deep grooves in the armature which means that the four iron portions of the armature correspond to the pair of main poles and the pair of supplementary poles in the firle magnet. The iron parts of the armature are held together and magnetically insulated also by aluminum, the driving shaft and the armature pole pieces being locked together in a die-casting process.

Returning to the magnets the supplementary pole pieces which are made of soft iron laminations are also die cast into their aluminum cases and it can be seen in the lengthwise section that the laminations are brought a good distance back of the horseshoe. It is between the ends of these projecting supplementary pole pieces that the coil unit is placed. This consists of a soft iron core, having a low tension and a high tension winding, so there is a magnetic circuit from one of the supplementary pole pieces through the core of the coil and back via the other supplementary pole. When the armature is in position the magnetic circuit passes from one main pole through a segment of the armature to one of the secondary poles, thence through the core of the coil unit and back via the second supplementary pole, opposite armature segment and south main pole.

It is now possible to explain the condenser effect of this circuit. When the armature is rotating the passing of the iron portion across the faces of the pole pieces sends a series of magnetic "charges" into the projecting portions of the supplementary poles. Through the air surrounding the latter a certain amount of magnetic leakage can take place, so we may regard the upper and lower supplementary poles as the inner and outer coating of the condenser. The air gap provides a constant leak or discharge resistance so that the flux which passes through the core of the coil unit cannot be increased above a certain point.

This construction lends itself very readily to the four-spark system and the Berkshire company expects to make a number of this pattern. The four-spark machine, of course, runs at half the speed of the two-spark type. It is slightly lighter than the two-spark model. The range of Berkshire machines includes a two-spark pattern for four-cylinder engines and for six-cylinder engines, while four-spark models are made for four, six, eight and twelve cylinders.



Left—Section of two-spark model of Berkshire magneto for four or six-cylinder engines. Right—Section of a four-spark model for twelve cylinders. Center—View from rear end with coil unit removed and breaker box cover taken off.

Left and Center—Four-spark, twelve-cylinder Berkshire magneto. The left view shows the way the coil unit and breaker mechanism can be removed. Right—A two-spark pattern for four cylinders.

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

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MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Motors for Model Aeroplanes

An Electric Driven Model

(*Continued from page* 700)

Experimenting with models driven by electricity has never been attempted in this country to the knowledge of the writer. The only one to have experimented in this respect with any degree of satisfaction was Mr. H. R. Kerruish, an English model flyer who experimented with a model driven by an electric motor and carrying its own batteries. It weighs inclusive 9½ ozs. It had an area of 3½ sq. ft. The thrust (static) given is 2 oz., which is just sufficient to fly it, leaving hardly any reserve of power. The chief dimensions are: Span, 4 ft. 6 ins., chord, 9 ins., overall length, 2 ft. 11 ins. Elevator, span 18 ins., chord 4 ins. The propeller, 14 ins. in diameter and 10 ins. pitch. The complete weight of the plant is 5.5 ozs., and of the model, 4 ozs. It is very lightly built, but nevertheless is quite strong. It flies at 7:5 m.p.h. in a dead calm, but will not fly in any wind. The power plant is made up of a common tri-motor (tripolar-motor?) specially wound and carefully lightened, driven by six small cells constructed somewhat on the lines of the Delarue silver chloride cell, but embodying certain alterations which are known only to Mr. Keruish. The thrust of 2 oz., mentioned above is given off by the plant for a period about one and a half minutes. He cut down weight in every possible way, carpet thread soaked in glue for bracing is used instead of wire, and the planes are covered with the lightest chiffon doped with the thinnest solution sufficient for coherency. The model has flown quite well in suitable weather. The model was given its initial flight in the road opposite the inventor's house after dark, when little traffic was about, enough light to do so being afforded by the gas lamps. The model was started off in the middle of the road and the inventor keeping up with it by running, which was possible owing to its slow speed. As it has such a small reserve of power, it only rose about 4 ft. high, but kept fairly consistently at that height, so that it was possible to keep it going in the direction desired by lightly pushing the front to one side or the other. On one occasion the model was steered down the road in this manner for a distance of 152 yards, the flight then only finishing owing to a connection working loose.

The general length of flight is considerably more than this, about 250 yards, or so. It does a fairly good duration owing to its slow speed, although Mr. Kerruish never actually timed it.

(*To be continued*)

A Model of a Bleriot Monoplane

By Fred W. Glatt.

A few months ago there was an article in one of the New York magazines about the construction of a flying model of an aeroplane, made by a Boy Scout.

Being a Scout myself, I was naturally interested in what a fellow Scout had done, and further, having a mechanical turn of mind, it afforded me much pleasure to plan and make my own model.

My earlier model was of the Cecil Peoli type, but to my intense chagrin, I found that I had constructed it of too heavy material, which would have required something stronger than my rubber motor to propel and maintain in the air.

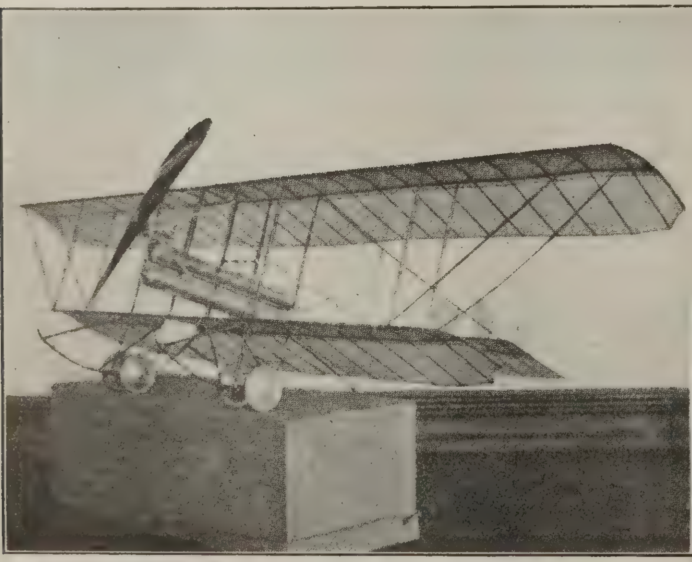
Later I found that I could construct designs to conform to my own ideas better than I could copy other models, and my most successful type has proved to be a monoplane somewhat similar to a Bleriot, or a type which, in the large plane, could be used as a warplane.

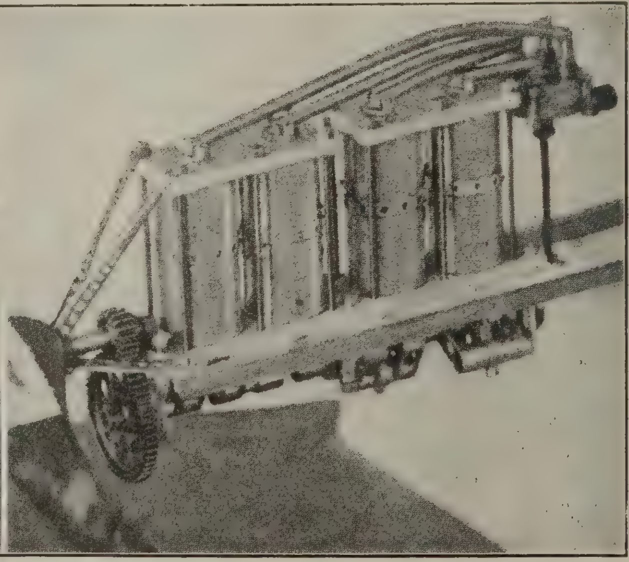
This plane is 3 ft. 4 in. long from the propeller to the tip of the rudder, and 3 ft. and 6 in. from tip to tip of the wings. The fuselage and planes are made of ⅛-inch square spruce, and the wings are covered with very thin tracing paper, glued on the frame. The fuselage is covered with silkoline, which is tightly stretched and to which I applied a coating of shellac.

The motor in this model consists of seven strands of 3/32-inch square rubber and the propeller is eight inches long. I use an "egg-beater winder" which I purchased of a supply house.

Another model which I purchased demonstrates very clearly the superiority of a compressed air motor, which drives a 15-inch propeller at a high rate of speed—3,000 revolutions per minute, it is claimed—and has 1/25 horsepower.

The adoption of compressed air motors shows the most practical means of propelling small models through the air.





A compressed air Caudron biplane model by Messrs. D. Hiscox and C. Desoutter (on the left) and a four-cylinder vertical compressed air engine on the right.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials cf contributor will be printed when requested.

Just So

"Why are these little motor wheels like golf players?
"Give it up."
"Why, because they putt, putt, and then miss.'"

Different Viewpoint

Kaiser—Can you deny that many London citizens concealed themselves underground during the last Zeppelin raid?

John Bull—No, but they didn't hide through fear.

Kaiser—Well, I suppose you call it bravery.

John Bull—No, English conservatism.—*Chaparral.*

Stronger than Us

Friend—Is that fellow strong?

Mechanic—Well, I guess! I saw him break a dollar the other day."

"How is Blinks, the stutterer, making out in the automobile business?"

"The poor fellow isn't doing so well. You see, he started to sell Stutz's last year and as yet he hasn't been able to gain sufficiently long interviews."

Precisely

Aviator (to his wife)—We're to have cabbage for supper, I knows it.

His Wife—Why, John Henry, what shocking grammar!

Aviator (sniffing the air)—I reiterate, my dear, I nose it.

While Flying High

"Have you heard the story about the feet?"
"No."
"You have two."

Crawford—I suppose Rockefeller, as usual, was the largest contributor to charity the past year.

Crabshaw—It looks so, the way gasoline is going up.

"Hello, what course are you taking?'
"B. A."
"What profession are you aiming at?"
"Oh, I'm heading for the bar."
"Wait a second and I'll go along."

At the Mechanics' Boarding-house

"Make yourself ready for dinner, Si."
"We aintta goin' t' eat, be we?"

And the shade of Francis Bacon, alias Will Shakespeare, stirred uneasily in its wooden kimono.

Military Chatter!

"I got two checks from home this month," said the exhibition flyer.

"'Snothing," said the circus performer, "I got two checks and a serious repulse right in this village."

Minister—Young man, do you know the price of the pursuit of pleasure?

Blacksheep, Jr.—Yes, sir! Thirty cents the first mile and ten cents for every half mile after that.—*Lampoon.*

The following conversation took part between two aviators interned in Germany:

"How's come only the boys do that goose-step?"

"Why, you fool! Would you expect a chicken to walk like a goose."

Pilot to waiter—Is that butter good?

Waiter—Our butter speaks for itself.

Pilot—Well, if it is old enough to talk I don't want it.

The Aeronautical Jabberwocky

By R. E. deCASTRO

'Twas biplane and the fusilage
  Did warp and wing flap in the drift,
All tractor were the ailerons,
  And the chord did fin and lift.

"Beware the Monocoque my son,
  "The claws that Gnome, the teeth that Wright,
"And shun the dreadful aerofoil
  "And hydroplane the Grahame-White."

He took his cambered sword in hand,
  Long time the Curtiss foe he sought,
And rested by the Burgess tree,
  And pontooned while he thought.

And as in staggered thought he stood,
  The Monocoque with eyes aflame,
Came warping through the Hall-Scott wood,
  And Zeppelined as it came.

One-two, one-two, and through and through
  His cambered blade went snicker-snack.
He left it dead, and with its head
  He went stream-lining back.

"And hast thou slain the Monocoque?
  "Come to my arms my Langley boy!
"Oh Bleriot day, caloo calay,"
  She Helicoped in her joy!

'Twas biplane and the fusilage
  Did warp and wing flap in the drift,
All tractor were the ailerons,
  And the chord did fin and lift.

Spectacular aircraft raid which cleared the enemy trenches.
—Courtesy N. Y. Evening Sun.

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HOW THE FIRST UNIT OF THE AERIAL COAST PATROL WAS ORGANIZED

MRS. HENRY P. DAVISON, wife of H. P. Davison of J. P. Morgan & Co., who is principally responsible for the organizing of the unit of the Aerial Coast Patrol of Port Washington, Long Island, has been interviewed by the *Times'* aeronautic editor and following is part of the interview.

Mrs. Davison told the *Times'* editor that she had taken up this task.

"To show mothers that flying is sane, safe, wise and constructive work for their sons to take up in connection with preparedness for our national defense."

As evidence of her belief, Trubee Davison, her son, has been flying his own flying boat for some weeks and a corps of college men have been in training at Peacock Point for the last two months.

The members are Robert A. Lovett, son of Robert S. Lovett, whose country home is Woodfold, at Locust Point; John Vorys, son of Judge Vorys, of Columbus, Ohio; John Farwell, 3d, of Chicago; Albert Ditman, son of A. J. Ditman, of Englewood, N. J.; Wesley Laud Brown, of Englewood; Artemus L. L. Gates, of Iowa; Erl Gould, son of the late Dr. Elgin R. L. Gould, City Chamberlain during 1902-'04, and Allen Ames, C. D. Winam, and A. D. Sturtevant. W. F. Sullivan, who is a Lieutenant of the Royal Flying Corps, and who recently returned to this country, and H. P. Davison, Jr., now serving with the American Ambulance Corps in France, will join the squad in September.

It is expected these men will form the first New York unit of the Aerial Coast Patrol, as soon as Congress authorizes the formation of that system of coast defense.

Mrs. Davison is responsible for the formation of the flying squad. Before giving her consent she had to overcome a conviction that flying was the most dangerous avocation on earth; further than that, Mr. Davison, who held a similar belief, had to be converted before the training school could be established. Her desire to support the preparedness movement was primarily responsible, said Mrs. Davison, for her finally giving her consent for her son to take up aviation.

When Trubee Davison came back from Yale, for his vacation, all arrangements had been made for him to join his brothers in France as a member of the American Ambulance Corps. He was to have sailed in a few days. Then the Mexican situation developed and both he and I agreed that his first duty was to stay here and do his part for his own country. He first decided to join the Yale Battery, but he is only 20 years old and it was necessary for his father to sign his enlistment papers. Mr. Davison was away and by the time he could be reached it was too late and the battery plan had to be given up.

Knowing the need of aviators along the border, Trubee Davison then decided to learn to fly and spoke to Mrs. Davison about it. She was absolutely opposed to his doing so, because she felt that flying was but one step removed from death. But he was insistent and she got in touch with John Hays Hammond, Jr., and asked his advice. He said that Trubee ought to take up flying, and told me how safe it was when properly done. He referred them to Admiral Peary, who was then in Washington, and Trubee Davison and Robert Lovett went to see him. The outcome of these interviews was that Mrs. Davison was converted and willing to aid as much as possible in preparing her son to serve his country as an aviator.

"Then Mr. Davison returned," Mrs. Davison states, "and the project was submitted to him. He was as much against it as I had been, but said, 'While I am very much opposed, I have an open mind and will investigate.' He did so. I don't know what he did or to whom he talked, except that Mr. Woodhouse of the Aero Club was a member of one family consultation, but at the end of three days, he gave his consent.

"Immediately after, the formation of the aviation squad began. My son communicated with his friends by long distance telephone and telegraph, and within a few days seven or eight of them had promised to come as soon as they could and join the school. Most of them are Yale men, and two others now training at Governor's Island will soon join them.

"Then we found that there were no flying boats available, and for a time it looked as though it would be difficult to get started. However, the Wanamaker Flying School had located near here a few days before and had just received a new flying boat. Arrangements were made for its use, and David McCullough, instructor of the school, agreed to take charge of our squad.

"Serious work began immediately. Mr. McCullough is a very competent instructor, and does not believe in taking risks or doing 'stunts.' He started the boys at the bottom, doing the work of mechanics, before any attempt was made to teach them to fly. They rose at 5 o'clock in the morning and went to the hangars. Then they came back to breakfast, returning to their work again as soon as the meal was finished, and so it went the whole day. In the evening they would return to dinner, hot, tired, and dirty, and more enthusiastic than ever. At dinner there was only one topic aviation."

Aero Club of America Urges Action on Aerial Patrol System

THE Aero Club of America having been advised by Congressman Lemuel P. Padgett, Chairman of the Committee on Naval Affairs of the House of Representatives, that owing to the pressure of time there would be little opportunity of considering the bill which provides, "to

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REPORT OF INVESTIGATION OF ROYAL AIRCRAFT FACTORY CONTAINS LESSONS FOR U. S. AIR SERVICE

FOLLOWING the nation-wide criticism of the administration of the British Air Service, the British Government authorized an investigation and this investigation brought out that the trouble seemed to be centred in the Royal Aircraft Factory. A Board, of which Sir Richard Burbidge is chairman, was appointed to investigate the Royal Aircraft Factory, which is located at Farnborough, England, the Board being requested

"To inquire and report whether, within the resources placed by the War Office at the disposal of the Royal Aircraft Factory and the limits imposed by War Office orders, the organization and management of the factory are efficient, and to give the Army Council the benefit of their suggestions on any points of the interior administration of the factory which seem to them capable of improvement."

A year and a half ago, when there was an attempt made to make the U. S. Government take up manufacturing of aeroplanes and motors it was stated by those who proposed Government manufacturing that the Royal Aircraft Factory was manufacturing aeroplanes and motors for the British Government. AERIAL AGE denied this and pointed out that England was handicapped because up to 1912 the British authorities had relied on the Royal Aircraft Factory and neglected to encourage the civilian aeronautic trade. After 1912 the fastidious Royal Aircraft Factory authorities delayed developments in the Royal Flying Corps to conduct experimentations which never ended. The civilian aeronautic trade starved while the Royal Aircraft Factory experimented and but for Lord Churchill, who put his personal efforts as head of the British Admiralty to develop the Naval Air Service, England would have been in a sorrowful plight when the war started. As it was, the neglect of the civilian trade was almost fatal to the cause of the Allies.

The Investigating Committee sets forth the functions of the Royal Aircraft Factory as follows:

"The functions of the Royal Aircraft Factory we understand to include original designs of aeroplanes and engines, improvement of existing designs, manufacture of experimental aeroplanes, engines and their parts, and aeronautical devices; study and experimental work in all material used in an aeroplane; preparation of drawings and specifications for contractors, and in certain cases, supervision of manufacture; repair of aeroplanes and engines, and provision of aeroplane and engine parts for maintenance; production of aeroplanes in limited quantity; and emergency work of all kinds to assist contractors or to make good the failure of contractors.

"From which it is apparent that the War Office has laid it down that the Royal Aircraft Factory should be devoted to experimental rather than manufacturing purposes."

When this report reached Lord Curzon, the Chairman of the Air Board, he took occasion to emphasize that the actual construction of aeroplanes outside of experimental machines is less than 10 per cent of the total construction done at the Factory and strongly disapproved the suggestion that engines might be manufactured at the Royal Aircraft Factory.

Between 6 and 9 Months to Complete Designs for New Aeroplanes

With its huge facilities it takes from 6 to 9 months to the Royal Aircraft Factory to complete designs for new aeroplanes. Our Army and Navy authorities, who have been complaining because manufacturers make them wait when orders are given for "modified" machines should take notice. American manufacturers have actually been speedy in developing new types. Foreign buyers state that the only reason they purchase aeroplanes here is that they get advanced types with new ideas.

The Committee reports:

"We were informed that the preparation of a complete design of a new aeroplane occupies 6 to 9 months before any practical building in quantities can commence."

British Government Pays for Alterations of Plans

American aeroplane manufacturers have often been doing business with the Army and Navy at a loss, being robbed of the margin of profit by alteration of plans. The report of the Investigating Committee shows that the British Government pays for such alterations, which policy is approved and emphasized by the Board as one of the approvable actions of the Royal Aircraft Factory. The report says:

"We were furthermore informed that it does not infrequently happen that the exigencies of war pressure have made it necessary to place orders with the trade for complete machines before the governing designs are completed in all particulars. It is almost inevitable that up to the time the design is actually finished and proved by the experimental machine, alterations in dimensions of parts will be made to occur when orders have been placed with the trade before such a condition of affairs has been arrived at, contractors must be called upon to alter, it may be to even scrap and reproduce parts affected. Payment is, we understand, made in compensation for such variations."

Lack of High Powered Engines

The report of Board continues:

"From articles and letters in the press it seems to be considered that British aviators, as compared with enemy aviators, suffer from want of speed in aeroplanes. If this complaint is well founded, there would appear to have been some lack of foresight (whether on the part of the Royal Aircraft Factory or the War Office is not clear) as to the size of engines required to meet war conditions. We are informed that higher powered engines are now being bought from the trade, that some have already been delivered and are being fitted into concurrently produced machines."

Lord Curzon adds to this that it takes not less than ten months to arrange for the production of engines even with the huge resources of the Royal Aircraft Factory.

Lack of Material

"It has been brought to notice that the experiments and other manufacture have not infrequently been delayed owing to lack of material."

This statement of the Board reminds us that some of the rushed orders for military machines could not be filled. There is only one solution to this—placing orders for steady deliveries far enough ahead so that manufacturers can secure materials needed.

The Aeroplane

Behold am I a thunder-driven heart!
And all a glorious shimmer of new wings!
Above the city and the dust of things
I, like the eagle at the sun, upstart.
I tear the tempest and the cloud apart;
I wheel in triumph where the planet swings,
And man the worm I lift a king of kings
Breasting the light where sunset arrows dart!

The birth have I seen of a brave new world—
This kingdom of ether spacious and wide;
Here in the air lanes by the winds imperiled
Secure and safe at night or noon I ride;
The soul of Icarius in steel and wire
I mount the height, higher and ever higher!

EDWARD WILBUR MASON, in the *Craftsman*.

THE NEWS OF THE WEEK

Carlstrom Flies 661 Miles in 521 Minutes

Carrying one passenger and flying a twin-motored Curtiss hydroaeroplane, Victor Carlstrom on August 25, made a new American distance record when he covered 641 miles in 8 hours and 41 minutes. This is a new record for distance covered in one day, and unless the mark is bettered, Carlstrom will win the Curtiss marine trophy for this year. The trophy was won last year with a flight of 554 miles by Oscar A. Brindley, who flew a Martin Model S seaplane.

Carlstrom's flight started at 6:23 a. m., and finished at 4:18 p. m., he having been in the air 8 hours and 41 minutes. He flew in a circular course between Newport News and Cape Charles. The flight was made in a heavy fog which forced him to steer by compass.

He also carried a passenger, Percy Kirkham, a mechanic, whose services were never needed in the fourteen laps.

The event was held under the direction of Capt. T. S. Baldwin of the Atlantic Coast Aeronautical Station, who said after the flight:

"The machine used by Carlstrom is the same used earlier in the week before members of the Navy Aeronautic Board. It is the most wonderful thing of its kind in the world, and Carlstrom handled it splendidly. It answered him in everything he desired. We expect to send this machine to sea for a long voyage within a short time."

Among Carlstrom's other feats was a flight from Toronto to New York, a distance of 600 miles, in 400 minutes. He also flew from Newport News to New York last May, and then from New York to Washington, carrying Alan R. Hawley, president of the Aero Club of America, and a special aeroplane edition of the New York *World* at the time Congress was considering the Army Appropriation Bill.

Curtiss Twin-Motored Hydro Gets Navy Tests

The new twin-motored Curtiss hydroaeroplane was tested over Hampton Roads August 21.

The test was witnessed by a naval aeronautic board composed of Naval Constructor Richardson, Lieut. W. G. Child and Lieut. M. W. Bronson.

The machine, which made three flights, made a speed of 80.98 miles per hour in a wind of six miles about 30 degrees off course, hence the equivalent speed was equal to 81.75 miles per hour. The landing and get-away speed was estimated at 45-48 miles per hour. The best climb was 2,650 feet in ten minutes, rising from the water. The weight carried included: Pilot and passenger, 300 pounds; gasoline, 82 gallons, 506 pounds; oil, nine gallons, 72 pounds; instruments, 22 pounds; total 900 pounds.

After the test on Hampton Roads the pontoons were detached and flights made over Newport News and Hampton.

Navy Hydro to be Exhibited in New York

The use of electricity in national defense and in modern warfare will be shown by the War and Navy departments, at the New York Electrical Exposition which will be held Otcober 11 to 21, at Grand Central Palace.

Under the direction of the Navy Department the latest type of hydroplane, with a 35-foot spread of wings, will be exhibited. The Navy exhibit will also include a 5 kilowatt wireless sending and receiving equipment such as is used on a modern battleship, models of the latest type of electrical equipment used in the Navy Yard, a demonstration of the interior wiring for communication and fire control of a modern battleship, which will be constructed and operated by students of the electrical class of the New York Navy Yard, and a model of the old frigate Constitution.

The War Department exhibit will be prepared by the signal corps of the Department of the East of the Army, and will consist of all electrical communication apparatus used by a modern army in the field, including wireless, telegraph, telephone, fire control communication set, and a radio tractor set.

Army Specifications for Military Training Machines

Aeronautical specification No. 1001 has been issued from the office of Lieut.-Col. George O. Squier, in charge of the Aviation Section of the U. S. Army, covering the military training (advanced) aeroplanes, which the War Department will shortly order.

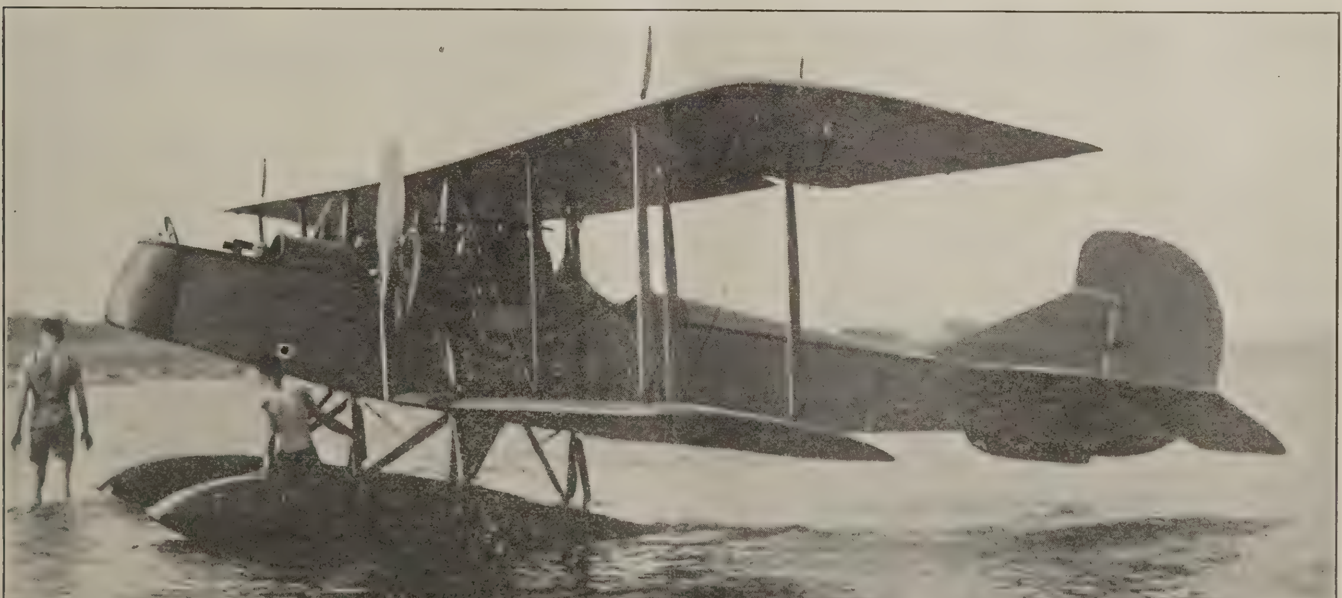
With but few exceptions these specifications duplicate those issued for the primary machines, and which are published in the August issue of AERIAL AGE. These exceptions are as follows:

The horsepower shall be between 90 and 110. The safe horizontal low speed shall not exceed 43 miles an hour. At least one machine of the group, at the discretion of the inspector, shall be required to attain 10 000 feet in 75 minutes. The climb shall not be less than 3,000 feet in ten minutes. The landing gear is to be of the two wheel type, differing from the two wheel type of the primary machine. The gasoline tanks, oil and water reserves shall be of sufficient capacity to permit of a flight of at least three hours.

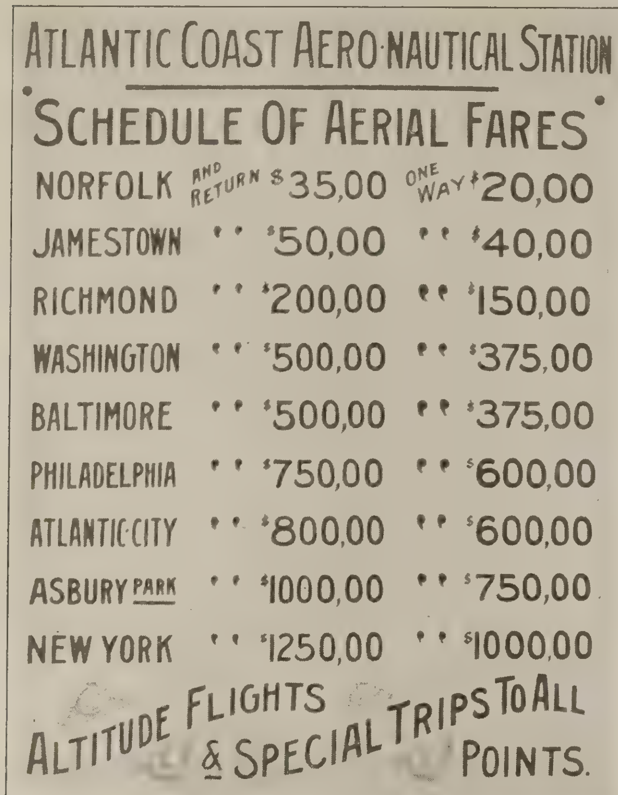
In all other details the specifications are the same as for the primary machines.

Air Line Planned

As a result of the flights made to Atlantic City from Philadelphia in flying boats by E. K. Jacquith and George C. Thomas, promoters, are considering opening a passenger line of flying boats between Atlantic City and Philadelphia. This will not be done this year, but probably will be started in the early part of 1917. It is proposed to make two round trips a day.



The twin-motored Curtiss hydroaeroplane in which Victor Carlstrom made an American distance record by flying 661 miles



The schedule of fares at the Atlantic Coast Aeronautical Station. Victor Carlstrom's recent flight of 661 miles demonstrates the possibility of arranging such air cruises

Export of Aeroplanes

The following were the exports of aeroplanes and parts during the week of August 20: To Norway, $15,000; to Great Britain, $12,367; to Portugal, $4; to Russia, in Europe, $38,000—total, $65,371.

Aviation School for Cuban Army

Capt. Augustin Parla, of the Cuban army, arrived in New York August 28, to make an investigation of military aviation with a view to establishing an aeronautic school for Cuban army officers. He will remain here for six months.

Capt. Parla is himself an aviator of experience. In 1913, he said, he won the Glenn H. Curtiss medal by flying from Key West to Mariel, Cuba, a distance of 117 miles, without a guide or an accompanying vessel. He will remain in Buffalo for the greater part of his stay here, he said, taking up hydroaeroplane work. He was ordered here by Gen. José Marti, chief of staff of the Cuban army. He was accompanied by his wife, who but recently celebrated her sixteenth birthday.

Radio-Controlled Torpedo Wins Favor of Navy and Army Experts

Within the next few years, naval experts believe, the radio-controlled torpedo invented by John Hays Hammond, Jr., will have an established place in the United States Navy, and mother ships equipped for sending out and directing the movement of torpedoes will be a regular auxiliary of the American fleets. These torpedoes can also be directed from aeroplanes, as well as from ships and shore stations. At present the Navy Department is permitting the coast artillery corps of the Army to conduct experiments with the new torpedo, but as soon as it has been installed as an adjunct of the coast artillery defenses of the country—as the War Department now contemplates—the Navy Department will take up the experimental work where the coast artillery leaves off and will adapt the torpedo for purely naval use.

Congress has appropriated $750,000 for the acquisition of this wonderful invention, and it will be installed at Fisher's Island, in Long Island Sound; at Corregidor Island, at the mouth of Manila Bay; at Honolulu; on both sides of the Panama Canal, and at Portland, Me.; Boston, Narragansett Bay, Cape Henry, San Francisco and Puget Sound.

The recent fortification act provided for the acquisition by the War Department after Mr. Hammond had demonstrated his torpedo to an Army board. As he has already fully explained his invention to the officers of the Army and convinced them of its value as an offensive weapon, this conidtion is regarded by military experts here as formal.

The Army is taking every precaution to prevent the details of the mechanical construction of the Hammond torpedo from becoming public knowledge, as it is realized that the United States has obtained a device which will revolutionize naval warfare and which may in the course of the future development of naval science eliminate the system of firing torpedoes from submarines, destroyers and larger craft. If the system of controlling torpedoes invented by Mr. Hammond can be adapted for naval use it will unquestionably supplant the use of other forms of torpedoes because of the greater accuracy and more certain destruction of the enemy's vessels.

Discussing the use of the Hammond torpedo, Brigadier General Erasmus M. Weaver, chief of coast artillery of the Army, through whose efforts the Hammond torpedo system was obtained by the War Department, recently said:

"Mr. Hammond first came to my office in the fall of 1912 and stated that he had been experimenting with the control of ordinary boats by radio energy. He told me what he had accomplished and asked me if such achievements would be of value in coast defense. I told Mr. Hammond that if he could accomplish what he said he could it would be of value. He said he would go back and experiment a little longer, and about two years later he reminded me, through a letter, of my promise, and Colonel Davis, of the Coast Artillery Corps, and I went up to Gloucester to witness a demonstration of his invention. I went to the operating house on the shore of the bay, where there was a man seated at what appeared to be a telegraph instrument, and out on the water a boat was moving. After a few minutes' conversation Mr. Hammond said, 'If you will give any instructions to the boat it will execute your orders.'

"I asked that the boat, a very rapid moving motor boat, be made to go to the right. The operator touched a button and the boat immediately went off to the right. Then I said: 'Now have it go to the left, and he pressed a button twice, and off it went to the left. Then I asked him to have it go around a buoy about 5,000 yards out in the bay, and by operating a button it went up to a buoy and then around it one way. I asked him to have it go around the other way, and it went around in the opposite direction. A schooner was coming in, and I said I would like to have the boat pass in front of the schooner. It made for the schooner and passed in front of it."

According to General Weaver, Mr. Hammond and the other officers who have seen the radio torpedo in action, they can be controlled from an aeroplane as well as from a shore station.The scientific principles involved are the same, but this phase of the invention has not been developed to its fullest extent.

Jersey Aero Squad to Get Rifle Practice

General Bird W. Spencer, inspector general of rifle practice and commandant on the state rifle range at Sea Girt, N. J., has completed arrangements for the first aeroplane rifle practice in this country. It will be held September 5 by members of the aviation squad of the First Battalion, New Jersey Naval Reserve, with headquarters at Hoboken. Nearly a hundred members of the reserve are here for rifle practice, and the plan has been worked out, following a suggestion made by Lieutenant J. Homer Stover, in charge of the aviation squad of twenty-three.

An Atlantic Aircraft Co. biplane has been procured from Garden City, and will be flown by Albert Heinrich.

The target will be 50 feet long and 6 feet wide, and will be built on the beach, near the present rifle butts. The target will be shot at from varying distances up to 500 yards, at heights of from 50 to 300 feet, and there will be a skirmish run during which the riflemen will fire as many shots as can be sent while flying at from 60 to 80 miles an hour, from a point 500 yards away from the target until it is reached. Governor Fielder and army officers from Governor's Island will probably watch the practice.

Aeroplanes Fly Over Troop Review

War-like efficiency radiated from the ranks of the troops of his command who passed in review August 21 before Gen. J. J. Pershing, leader of the expedition.

"The finest body of men I ever had the pleasure of commanding," declared the general after the last wagon rumbled past, "and fit for any action."

Perfectly drilled and equipped, the 5,000 men made an impressive spectacle. A picturesque touch was the appearance on the scene of three aeroplanes, which came through the morning mist and skimmed just above the moving columns.

New Curtiss Aeroplane Co. Directors

George R. Rand, John C. Clawson and Walter S. Cook have been elected directors of the Curtiss Aeroplane & Motor Co. There were two vacancies on the board and a third was created by the resignation of G. R. Hall, formerly treasurer of the company.

Mr. Rand is president of the Marine National Bank, of Buffalo, Mr. Clawson is a local capitalist and chairman of the executive committee of the Marine National Bank, and Mr. Cook is a prominent Buffalo lawyer. The company has felt the desirability of having stronger local representation at Buffalo, where its chief plant is located.

The executive committee has been enlarged, and will consist of Glenn H. Curtiss, John C. Clawson, George F. Rand, Walter S. Cook, and Monroe Wheeler, all of Buffalo.

G. C. Houston, of Jamieson & Houston, 40 Wall Street, has been appointed general manager of the company, succeeding K. B. McDonald, who will go to Europe as a special representative of the company, and will also act as consulting engineer.

Wind Storm Damages Army Aeroplanes

A heavy wind storm August 23 threatened destruction to army aeroplanes stationed at the field headquarters of the American Punitive Expedition in Mexico. The machines were saved by the officers and men of the First Aeroplane Squad, who clung to the anchor ropes and hastily improvised guys until the wind abated. The machines were slightly damaged.

Miss Mack Flies Over Niagara Falls

"It rides smoother than an automobile. I'm going to take a course now. I wasn't a bit afraid."

These were the first words of Miss Norma Mack, daughter of Norman E. Mack, of this city, formerly chairman of the Democratic National Committee, as she alighted from an aeroplane which had carried her in a spiral over Niagara Falls.

Miss Mack was a passenger aboard a Curtiss aeroplane, piloted by Lieutenant Phil Rader. He dipped the machine over the great cataract at a rate of eighty miles an hour. From the aerodome to the falls and back is thirty-nine miles. They made the distance in thirty-two minutes.

Miss Hariet Mack, another daughter of Mr. and Mrs. Mack, also made the trip in an aeroplane driven by Major W. M. Campbell, of the British army. Mr. and Mrs. Mack saw the feats.

Col. Fleischmann Hurt in Aeroplane Fall

Colonel Max C. Fleischmann, of Cincinnati, a cottager at Narragansett Pier and noted as a sportsman, had a narrow escape August 28, when his hydroaeroplane fell and was wrecked in Point Judith Salt Pond, near Wakefield. Mrs. Fleischmann witnessed the accident.

When Colonel Fleischmann was about 150 yards from shore and flying at a moderate height, preparing to land, his machine dipped and the right wing went into the water first, then the left wing, and after that the machine collapsed.

Colonel Fleischmann was carried under the engine of the hydroaeroplane and from this perilous position he was rescued. He was taken to his cottage at the Pier, where it was found several ribs were broken. During the summer he has made several notable flights over Narragansett Bay.

Flying Boat Rescues Man Drifting to Sea

As the result of a quick rescue August 21, at Atlantic City, the authorities have added flying boats to the beach life guard service. The machines of Kenneth Jacquith and Beryl Kendrick, who have parking privileges on the upper beach, are now officially part of the life saving equipment.

Mr. Kendrick gave the use of his craft to the aid of Captain Albert Hall, of the beach control, to make a long run to save Edwin Welser, a bather, who had drifted a quarter of a mile out to sea on an inflated tire.

Captain Hall sighted him, and with the flying boat, made a quick run to his rescue. The bather was brought ashore in the flying boat and received medical attention.

Miss Lyra B. Nickerson Ill of Ptomaine Poisoning

Miss Lyra Brown Nickerson, known as one of the wealthiest young women of Rhode Island, who presented the Sturtevant seaplane to the Rhode Island Militia, is seriously ill in her summer cottage of ptomaine poisoning.

Sued for Broken Aeroplane

The Boughton Flying Machine Company, a North Dakota corporation with an office at 4424 Larchwood avenue, has begun suit in the Municipal Court against Harvey W. Kays and Haldeman von Figyelmessy, of 5444 Baltimore avenue, for damages to the plaintiff's flying machine. It is set forth by the Boughton Company that on August 5, of this year, at the aviation grounds of the navy yard, at League Island, when von Figyelmessy attempted to operate a scout biplane, owned by the two defendants, he collided with the Boughton machine, wrecking it to the extent of $1,000.

De Lloyd Thompson to Race Elfrieda Mais

De Lloyd Thompson, the intrepid birdman, and Elfrieda Mais, champion woman auto race driver of the world, are to decide the supremacy of land and air at the Minnesota State Fair, September 4 to 9. A mile race will be held between the two on Wednesday, September 6, and another on Saturday, September 9. The winner will be given a big trophy.

U. S. Aviators to Fly on Grape Day at San Diego

Spectacular flights of United States Army aviators, on a scale hitherto unattempted, will be one of the big features of Escondido's Grape Day celebration, on September 9.

Col. Glassford, United States officer in charge of the aviation school at North Island, has agreed to the arrangements. Capt. F. T. Lahm and Lieut. H. A. Dargue, two of the crack Army aviators, have visited Escondido and have located a satisfactory lighting station right near Grape Day Park.

The Army aviators will start at North Island, follow the coast line to Carlsbad and then fly inland to Escondido. This will mark the first time an aviator has ever flown over the Sunkist valley.

Escondido boosters, in appreciation of the co-operation of the Army aviation officials, were to-day planning to visit North Island on Thursday to make the acquaintance of the aviators, and to get a line of some of the flying "stunts" that will be featured on Grape Day.

The L-W-F tractor biplane owned by the aviation section of the Michigan National Guard, which was flown during the Guard encampment by H. W. Blakely

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establish an Aerial Patrol System, and for the education and training as aviators of the Aviation Section of the Naval Militia of the several States," is appealing to President Wilson, who has approved the plan to establish the Aerial Coast Patrol.

In the appeal to President Wilson, Mr. Alan R. Hawley, the president of the club, points to the fact that no appropriation has been allowed for aviation in the Naval Militia, and that the appropriation for naval aeronautics in the Navy Appropriation Bill is only half the amount asked by the General Board of the Navy. Therefore, the appropriation of $1,500,000 provided for in the Aerial Coast Patrol Bill is badly needed to facilitate the training and equipping of civilian aviators in connection with the Naval Mlitia of the twenty-two States which have Naval Militia organizations.

The bill, which was introduced in the Senate by Senator Charles F. Johnson, and in the House of Representatives by Congressman Julius Kahn, would connect the Aerial Coast Patrol with the Naval Militia, and put it under the direction and control of the Secretary of the Navy, and provides for furnishing the Naval Militia of every State with a suitable course of instruction, one or more hydroaeroplanes, and a competent instructor or instructors.

Steps have been taken to organize Aerial Coast Patrol units in the following States: New York, Maine, Massachusetts, Michigan, Ohio, California, Rhode Island, Virginia, Illinois, Pennsylvania, Maryland, Connecticut, New Jersey and Oregon. Also, by Yale, Harvard and Cornell undergraduates. Considerable private capital has already been spent by patriotic men and women to start these aerial coast patrol units, and Mr. Hawley, in his letter to President Wilson, urges the passage of this bill so that "the efforts of these patriotic people may be properly directed by the Navy Department, and the plan connected with our national defenses."

It is also pointed out that our Navy has only one aeronautic station, whereas England has ninety-four air stations on the British Isle alone. Likewise, while the navies of other countries count their aviators by the thousand, the United States Navy has exactly forty aviators, half of whom would not be available for flying service, because they are needed for such duty as inspecting aircraft and aeronautic motors and to manage the testing laboratories, engineering shops, etc., connected with the aviation service of the Navy. As the Navy has been five years in getting the forty officers for the aviation service, there is no hope of getting a thousand aviators for the Navy, except by making it possible for civilian aviators to become connected with it.

Harvard Aviators Ready for Licenses

After two months' training, nineteen members of the Harvard University Undergraduates Aero Training Corps have finished their courses and are ready to fly for pilot licenses.

This information is contained in a letter received by the Aero Club of America from Roger Amory, the Boston banker, who is Chairman of the Executive Committee of the corps. He wrote to learn what measures should be adopted to have the corps recognized by either the State or Federal Government, so that it might be available immediately for national defense.

The Harvard men may become members of the Aerial Reserve Corps recently authorized by Congress if the Government should establish an aviation centre at Boston, where their training could be finished under the direction of army instructors. If this cannot be done, it is likely that the men will be taken over for the aero corps of the National Guard. This provision would allow the men, all of whom are undergraduates at Harvard, to continue their training during the coming year and obtain their military pilot licenses.

The Harvard Aero Corps was started shortly after the close of the college year by a committee of Harvard graduates. Robert Bacon, former Ambassador to France, took the lead in the movement and made a standing offer of a $50 bonus to each undergraduate who obtained his license. When the initial announcement was made the Training Fund contained more than $9,000, and the committee appealed to Harvard men to add $10,000 to it. The cost of each undergraduate's training was not less than $400.

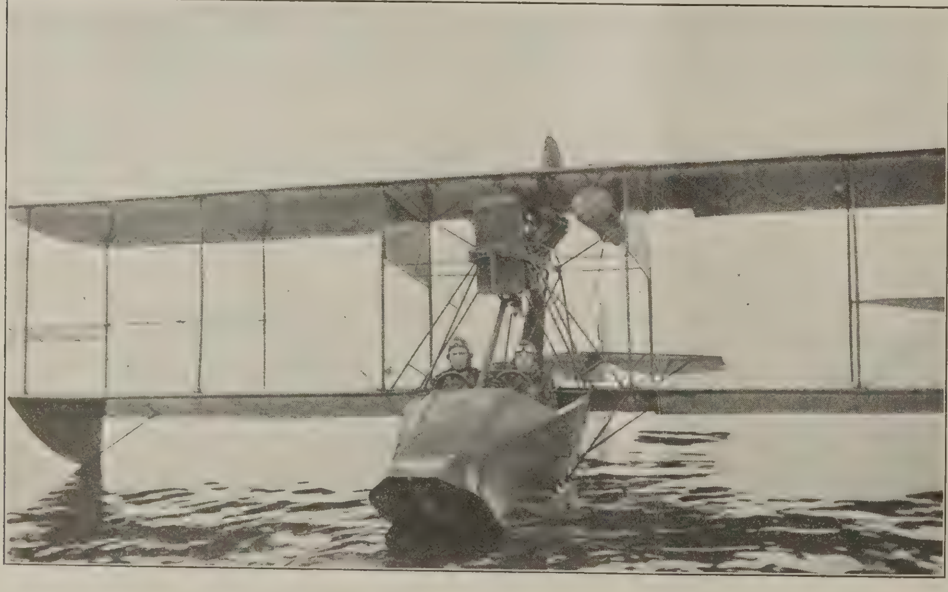
The nineteen undergraduates have been trained in three aviation schools, the largest number at the Curtiss School, near Buffalo. There they have lived in tents, about 100 yards from the flying field, with their own mess tent and caterer. Those in training there are Eben S. Draper of Boston, Frederic S. Allen of New York, Francis Inman Amory, Jr., of Cambridge; William Barlett Bacon of Brookline, Edmond E. Bates of West Medford, Mass.; Mahlon Philip Coolidge of Brookline, Hamilton Coolidge of Brookline, Donald Dunbar Harries of Minneapolis, Henry Hubbard Metcalf of Westborough, Mass.; Robert Hewins Stiles of Fitchburg, Mass.; and James R. Torrey, 2d, of Worcester, Mass.

Five are being trained at the Thomas School. They are Samuel Pierce Mendell, 2d, of Hamilton, Mass.; William Henry Meeker and Kenneth Merrick of New York, Arthur L. Richmond of Boston and Herbert Pulitzer of New York.

At the Wright School the following are in training: Earle Henry Beane of Cape Elizabeth, Me.; Thomas G. Hoopes of Newburyport, Mass., and George Clarke Whiting of Hingham, Mass.

The Executive Committee of the Hard Aero Corps, which has charge of the training, consists of William Thomas, George von L. Meyer, G. Richmond Fearing, N. Penrose Hallowell, Allan Forbes, Eliot Wadsworth, Philip A. Carroll, S. Huntington Wolcott, E. V. R. Thayer, Charles E. Perkins, Benjamin Joy, A. J. Drexel Paul, Roger Amory and Gordon H. Balch.

The undergraduate aviators will all take courses in aeronautical subjects in college, and next year it is expected that a much greater number will be trained, so that in the course of the next three years the Harvard aviators will form a valuable unit in the Aerial Reserve.



To reach a patient on Fire Island, Dr. George S. King, of Bayshore, L. I., used the flying boat of Alfred F. Croft in answering a hurry call to the beach across the Great South Bay. No sail boats were available. The six-and-a-half-mile trip consumed seven minutes. The boat operator carried the doctor to dry land on his back.

Personal Pars

O. L. Dunton, who has been engaged in the construction of a special type biplane at North Adams, Mass., is making arrangements to have it tested either at Garden City or at Sheepshead Bay.

Elwood Doherty entertained the spectators at Salem Willows shores (Mass.), August 18, by flying past in a Burgess-Dunne hydroaeroplane.

Ralph E. McMillen, National Guard aviator, will shortly attempt to break the record by flying at night from Omaha to Lincoln.

Creighton Hale, who is under a long term contract to star in the feature pictures of the Frank Powell Productions, Inc., is spending a great deal of his time at Mineola, L. I., with his new aeroplane, which he will use in the next picture of the Powell Company. Mr. Hale is a member of the Aero Club of America.

The newest aeroplane builder in Topeka is Ernest Greider, the eighteen-year-old son of Prof. W. H. Greider of the Topeka High School. Greider built the machine at his home, 615 West Seventeeth street, with no assistance. He is now assembling his machine on the Cole tract and expects in a few days to have Topeka people craning their necks for a look at Topeka's latest aircraft.

Ernest L. Patrick, who got his early training in aviation under Moisant, has gone to London, Ontario, to join the Canadian flying corps.

Joe Bocquel made exhibition flights at the state fair at Sacramento, September 1.

Floyd Smith, chief aviator for the Martin Aeroplane Company, announces that he will make a flight from San Francisco to Los Angeles City during the early part of September. Smith will pilot a new 'plane with an estimated speed of ninety miles an hour.

THE CALIFORNIA AVIATION CAMP

UNDER the auspices of the Aeronautical Society of California, having headquarters at Los Angeles, the Volunteer Aero Squadron had its inception and with the assistance of Major General J. Franklin Bell, commanding the Western Department of the War Department, permission was granted to train a personnel for a squadron with the understanding that the Aeronautical Society would defray all expenses, provide the aeroplanes and perform the work in accordance with the regulations governing the Training Camp and under the supervision of regular officers of the United States Army.

Under this agreement the four aeroplanes were furnished and the work has now been practically consummated. After carefully considering the matter it was decided to set up a field camp and perform the entire work, using only hand tools and if possible to actually construct at the Camp the parts for four aeroplanes and, so far as possible, complete the assembly of same.

The primary object of the Camp, of course, is to furnish instruction so that the sixty-five men in the squadron can be graduated and given certificates of proficiency in as practical a course as it is possible to condense in the four weeks' period of time. It must be remembered that no text books were available for instruction, but one was compiled and prepared by Lieutenant Hollis LeRoy Muller of the Coast Artillery, who was detailed for this purpose, and to act as Aviation Instructor at the Camp, by Major General Bell. The greatest commendation is due Lieutenant Muller, as his labors have resulted in evolving what could very easily be amplified into a text book or manual.

The nucleus of the organization came from Los Angeles, it having been determined in advance to endeavor to make the squadron a state-wide organization so that at the conclusion of the Camp a foundation would have been laid, not in the immediate vicinity of Los Angeles only but so that it could be enlarged in the northern part of California as well as in the southern. With this in view, only about twenty men were selected out of over one hundred applicants, in Los Angeles, these men being qualified to accupy executive positions and supplement the work of the aviators and paid mechanics employed by the Aeronautical Society.

The first two days of the Camp was spent in securing uniforms and tentage, distributing quartermaster's supplies and allotting the men to their proper messes, and so forth. During the balance of the week the Aero Squadron personnel built their hangars, work shops, set up the wireless aerials, built the office equipment and furniture, put floors in the tents, etc. By the end of the week the apparatus was in place and benches were constructed ready to mount the necessary tools.

After setting-up exercise in the morning the men report to the Aero Squadron at 7 a. m. and drill until 8:30 a. m., receiving military instruction and discipline. This work is done under the personal direction of Captain Harold Geiger, Coast Artillery Corps, an ex-Army aviator who commanded the 1st Aero Company at North Island and was on aviation duty in Honolulu. Captain Geiger is also in command of the regular detachement and has charge of the administration work of the Aero Camp.

The work of instruction, aside from the military, is divided into two parts, the theoretical instruction and the practical shop work. The squadron is divided into two companies. The period of instruction comprises six hours per day, three hours in the morning and three hours in the afternoon, the companies alternating between shop work and theoretical instruction.

The course of instruction in the classes is completely outlined in a pamphlet prepared and used as a text book and covering the following subjects:

1. Classification of Air Craft.
2. Nomenclature of Standard Tractor Biplane.
3. Duties of Crews and Care of Materials.
4. Repair of Wood, Fabric and Metal.
5. Action and Adjustment of Material.
6. Service of Auto-Trucks.

ADVANCED SUBJECTS

1. Aeronautical Motors.
2. Instruments.
3. Military Aviation—(a) Meteorology, (b) Aerial Navigation, (c) Flying, (d) Reconnaissance and (e) Combat.
4. Signals, Orders and Reports.

The shop work is divided into wood work and metal work, also in the assembly of parts and the work of adjusting the aeroplanes being flown daily and the repairing of same when smashes occur. The metal shop is equipped with shears, punches, braziers, both oxyacetylene and gasoline and no other tools except vises and hand bench tools. In the carpenter shop nothing but hand tools are used. The men have become remarkably proficient and are turning out a high grade of work which compares favorably with that of professional mechanics and considering the conditions under which the work is produced the results are really remarkable.

Special lecturers visit the Camp from time to time, covering subjects of which they have expert knowledge.

The Aero Squadron has made an excellent record on the rifle range, the average being somewhat better than the average of the Camp.

The four planes now in use by the squadron in this Camp are suitable for instruction purposes, but are not of a military type. The four planes now being built are the tractor biplane type, capable of high speed and carrying great loads and of sufficient strength to have 125 h.p. motors installed in them. It is the purpose of the Aeronautical Society, whose property the planes are, to turn them over to volunteer organizations at a nominal price, which will be much lower than the price at which same could be purchased from a manufacturer. The expense of constructing the planes is largely labor, which is being furnished by the men in the Training Camp, and it is hoped that men of wealth can be found who will act as patrons and will purchase these planes and the engines needed to complete them and present them as a patriotic contribution to the first four organizations applying for same.

The work of the radio department has been of the advanced order, as they have gone into the experimental field rather than endeavoring to repeat successful experiments of other organizations. The wireless telephone has been successfully used and the problems of communicating from the ground to the plane is the one now being worked on. This has never been successfully accomplished up to the present time, but if the efforts being fostered by the Aeronautical Society result in doing this, it will be of the utmost military value to the United States Government.

Only one serious smash-up has occurred, in which Aviator Lamkey, flying in the Bleriot racing monoplane, was overturned by a sudden gust of wind just when he was leaving the ground. The machine was completely wrecked, only the engine being saved. During the last week of the Camp the men who have been selected by the instructors because of their proficiency and natural qualifications to become aviators or observers, were carried as passengers, experienced pilots in the employ of the Aeronautical Society operating the planes.

SPECIFICATIONS FOR NAVY AEROPLANES

SCHEDULE 39 presenting the terms of bid for supplies for the U. S. Navy, covering three, six, nine and twelve aeroplanes, to be opened at 10 a.m., September 5th were issued on August 28th from the office of Rear-Admiral W. S. Benson.

The following is the complete terms of the bid together with the specifications:

CLASS 181.—*(Req'n 3, Office of Naval Aeronautics, C. and R. and S. E.—App'n: "Aviation, 1917"—Sch. 39.)*

To be delivered at the Navy Aeronautic Station, PENSACOLA, FLA., WITHIN.........DAYS after date of contract.

Bidders will insert in the above blank space the shortest time within which they can guarantee delivery, subject to penalty for delay as provided in Form A. Other conditions being nearly equal, the time of delivery will be considered in making award.

Stock classification No. 65.

Bids are desired for furnishing aeroplanes, complete, and power plants, complete, as follows:

Aeroplane.—Includes the aeroplane proper, exclusive of power plant items, and in order for flight, and as per the following specifications, and includes, in addition, a launching truck and the necessary shipping crates.

Power Plant.—Includes motors, propellers, radiators, starting devices, gasoline and oil tanks, piping, controls, gasoline and oil gauges, wireless outfit, power transmission system, tachometers, and the necessary shipping crates, etc., in order for flight, and as per the following specifications:

BID A.—*On the basis of furnishing 3 aeroplanes and power plants.*

Aeroplanes .... each
Power plants .... each

BID B.—*On the basis of furnishing 6 aeroplanes and power plants.*

Aeroplanes .... each
Power plants .... each

BID C.—*On the basis of furnishing 9 aeroplanes and power plants.*

Aeroplanes .... each
Power plants .... each

BID D.—*On the basis of furnishing 12 aeroplanes and power plants.*

Aeroplanes .... each
Power plants .... each

Bids to be itemized as above; unit prices to govern.

NOTE.—*Bids on this schedule should quote prices only, and should be forwarded in the usual manner to the Bureau of Supplies and Accounts. All drawings, blue prints, and descriptive matter illustrating the apparatus it is proposed to furnish, or amplifying the specifications, should be placed in a separate envelope and forwarded to the Office of Naval Aeronautics, Navy Department, Washington, D. C., in time to be received before the hour fixed for opening the bids. All such envelopes delivered late will not be opened and the bids will not be considered. These envelopes should be marked "Confidential," and should bear the name of the bidder, class and schedule numbers, and date of opening. After award of contract the drawings, etc., submitted by unsuccessful bidders will be returned.*

SPECIFICATIONS.

SPECIAL CONDITIONS.

Aeroplanes having characteristics differing from those specified will be considered, provided the differences are clearly noted in the specifications proposed, and provided the design proposed has sufficient merit to warrant such consideration.

It is desired to obtain the performance required on the lowest weight and power consistent with the other requirements of the specifications. What is wanted is a handy school aeroplane, embodying to the greatest degree practicable the qualities specified without the use of excessive power for the purpose. The performance outlined in these spcifications may be departed from moderately without prejudice to a design, but is intended as a close guide to the type desired.

NOTE.—The following specifications have been purposely made of a very general character, stating broadly the results which it is desired to obtain. Bidders are requested to state in particular detail the methods they propose to employ to attain these results, in order that their proposals may receive intelligent consideration.

The department reserves the right to reject any or all proposals under these conditions. Awards will be based on the merit of the design, the design and manufacturing abilities and facilities of the bidders, the completeness with which information is supplied, and the price and time of delivery. It is particularly desirable that bidders shall estimate exactly deliveries which can be met.

GENERAL REQUIREMENTS.

To be a naval aeroplane of the two-place, tractor, biplane type, and to conform in general to the detailed requirements of the following specifications:

PERFORMANCE.

Maximum Speed.—Not less than 52.1 knots (60 miles per hour) nor more than 60.7 knots (70 miles per hour).
Minimum Speed.—Not more than 34.7 knots (40 miles per hour).
Climb.—Two thousand five hundred feet in first 10 minutes from surface.
Getaway.—Not over 34.7 knots (40 miles per hour).
Landing.—Not over 34.7 knots (40 miles per hour).
Radius.—Four hours, full power.
Fly in wind of 30.4 knots (35 miles per hour).
Drift in wind of 21.7 knots (25 miles per hour).
Getaway and land in wind of 21.7 knots (25 miles per hour).

DESIGN AND CONSTRUCTION.

Throughout the construction of all aeroplanes and parts contracted for, designated inspectors shall have complete and free access to the shops, plans, specifications and records of tests of material involved in the construction of same. Where required, supplementary tests of materials and parts shall be made as directed by the inspector.

All parts to be of first class workmanship, material and design.

Alterations of parts, plans or material shall not be made without approval of the Navy Department.

Improvements developing between the dates of the contract and the completion of the machine shall be incorporated in the machine, if approved by the department, which shall determine finally the change of cost under the contract, if any is involved.

In the same manner any other changes or alterations ordered by the department after signing of the contract shall be considered and the change in cost determined.

Parts which appear defective in design, material or workmanship will be rejected and satisfactorily replaced unless the objection to their use is removed by a satisfactory demonstration of fitness. Aluminum shall not be used in the structural parts where strength is involved.

Protection from weather and salt spray shall be provided for all parts by the use of approved paints, varnishes, shellac, covers or metal plating, or by the use of non-corrosive material.

Portable covers for the cockpits and power plants shall be furnished with each aeroplane.

All interior woodwork will be given efficient protection against moisture. Particular care must be exercised to prevent access of moisture at faying surfaces, to end grain, and at butts, scarfs and joints. Such protection must be applied before final assembly of parts.

The color scheme will be natural finish or as approved.

The wing section used should be chosen with a view to efficiency and stability, and its characteristics in these respects must be known from laboratory tests.

The wings shall be readily and quickly removed or attached.

The control surfaces shall be of such proportions as to give positive control when flying at slow speed. They are to be capable of operation by either pilot unassisted or in conjunction.

Duplicate control leads are required to ailerons and rudders. The duplicate leads to follow as nearly as practicable different lines from those of the principal leads.

Means for hoisting shall be provided in the form of a fixed eye for a shackle over the top plane, and as nearly over the center of gravity when afloat as is practicable. The means of attachment shall be thorough and permanent and distribute the load to suitable members.

All parts shall be thoroughly trussed to withstand the launching impulse on the catapult. As this will depend upon the point of attachment and the float arrangement, prospective bidders should at once submit general arrangement plans to the department which will approximately indicate the point of attachment or any minor rearrangement of substructure required.

The floats may be of any type which will meet the requirements as to seaworthiness. They shall be substantially built to withstand the service intended, and to be stream lined as much as practicable without involving elaborate construction. They shall be divided into watertight compartments, provided with approved means for inspection and drainage while afloat and when resting on launching trucks. The floats shall be provided with towing cleats, of approved form, securely fastened to the float.

Transportation trucks of approved design are required with each aeroplane.

The following instruments of approved type are to be furnished and installed on the instrument boards:

Air-speed meter, tachometer.*

Longitudinal inclinometer, oil gauge;* air gauge.*

And the following instruments supplied by the Government shall also be installed or provided for:

Altimeter, compass.*

Those items marked with * are to be installed in pilot's cockpit only.

A suitable gasoline gauge, visible from the pilot's seat, to be installed on main gas tank.

POWER PLANT.

To be suited to the requirements of the machine and to be provided with self-starters so fitted and installed that the motor may be started from the pilot's seat.

The carbureter shall be provided with a means for heating and with a successful means for muffling to prevent fire in case of a blow-back from the engine. Provision shall also be made to prevent any danger in case of fire should the machine turn upside down.

Double independent ignition and double magnetos shall be used.

The motor shall be protected from moisture and spray.

The ignition and auxiliary circuits must be thoroughly protected from short circuits from spray, to insure against failure of the motor from this source. All aluminum parts are to be given protection gainst the effects of salt water.

All oil piping to be annealed.

The gas leads to reserve tanks, the control leads and the carbureter adjusting rod shall be provided with suitable and safe and ready couplings where these connections have to be frequently broken.

A positive system of pumping gasoline from the reserve tanks to the service tank shall be provided unless gravity feed or pressure feed from all tanks is used.

Gas, water and oil service pipes will be protected against vibration.

A positive means of cutting off the gas at the service tank shall be readily accessible from either seat.

At least one reliable method of stopping the motor shall be provided, to be operated from either seat.

Fuel tank capacity for at least four hours' flying at full power shall be provided. Fuel tanks are to stand an internal pressure of five pounds per square inch and shall be divided by swash-plate bulkheads. The heads of the tanks are to be so formed as to prevent crystallization due to vibration.

The service feed tank shall have a capacity for at least one-half an hour's flight, and shall be so fitted as to prevent danger from fire in case the machine should turn upside down.

All couplings and fittings in the gasoline line are to be thoroughly sweated on.

So far as practicable the entire power plant should be assembled as a unit on a good rugged foundation, which can be readily removed or replaced with a minimum disturbance of connections, controls and other structural fittings.

The motor shall, if practicable, be so installed as to permit of dropping the lower crankcase without the removal of the motor from its foundations.

A complete set of power plant tools to be supplied with each machine.

PROPELLERS.

The propellers shall be suited to the requirements of the motor and machine, and their efficiency should exceed 70 per cent. They should be efficiently protected from the action of spray and broken water. The hub face plates shall be thoroughly interconnected independently of the propeller bolts. A safety fitting shall be provided, so that in case the propeller bolts carry away, the propeller cannot come off the hub.

MOTOR TESTS.

Before installation, one motor, if of a design new to the department, to be selected, shall be put through the complete set of tests in succession as described herein. These tests shall take place at the navy yard, Washington, D. C.

Test A.—A run on the block to determine the maximum brake horsepower and the revolutions necessary to deliver the rated horsepower, to be followed by the calibration run for determining the b.h.p. r.p.m. curve.

Test B.—Two five-hour runs of the motor with calibrated moulinet or propeller at rated power. After the five-hour runs the motor shall be disassembled and the motor and the auxiliary parts shall be weighed. It will then be carefully examined and conditions within noted, particular attention being paid to the amount of wear and of carbon deposit. If the above tests and inspections are satisfactory, the motor shall be reassembled and given an additional one-hour run, without any adjustments or replacements during same, and during which observation shall be made in exactly the same manner as in the previous five-hour run. All other motors to be given tests at the factory the same as test B, except that there shall be one five-hour run only to be made with propeller calibrated at the Washington navy yard.

During the above trials records of the revolutions obtained and the corresponding power developed shall be made every fifteen minutes, together with notes as to the general action of the motor while running. The engine shall be thoroughly balanced, and vibration shall be a minimum. Oil and gasoline consumption shall be measured for each of the above trial runs and notes made as to the temperature of the circulating water at the inlet and outlet. No adjustments or replacements are to be made during the above trials.

Definition.—Full load comprises the aeroplane complete in order for flight and, in addition, fuel and oil for four hours' flight at full power and 375 pounds for pilots, instruments and equipment.

TRIALS.

Demonstration Trials.—Before entering the prescribed acceptance tests each aeroplane shall be set up and flown by a representative of the builder at such place as shall be agreed upon. During these trials the full load shall be carried, and it shall be demonstrated to the satisfaction of the inspector that the aeroplane is capable of meeting the requirements. Defective features, if any, developing in the course of these trials shall be corrected and demonstrated to have been overcome.

Acceptance Trials.—If the demonstration trials have shown that the aeroplane is capable of entering its acceptance trials with a reasonable assurance of meeting the requirements, it will be given acceptance trials at the Navy Aeronautic Station, Pensacola, Fla., at such times as may be agreed upon in the contract. In the case of duplicated machines, the demonstration trials will be all that are required, and they shall demonstrate that each additional aeroplane can perform consistently with the original of the type.

SEAWORTHINESS.

If the weather affords an opportunity, the aeroplane must ride at anchor or adrift in a 21.7-knot (25-mile) wind in Pensacola Harbor without danger of capsizing; otherwise stability shall be demonstrated to the satisfaction of the inspector.

Adrift, it should head into the wind.

Underway at low speeds it should steer readily.

With Full Load.—The aeroplane shall get away in a calm in smooth water in not over 1,500 feet (from a start with the motor idling at not over 25 per cent. of the revolutions for full speed).

It shall be capable of alighting and getting away in a 21.7-knot (25-mile) wind in Pensacola Harbor.

It should be capable of landing at high speed without danger of nosing rudder.

It should begin planing at not over 21.7 knots (25 miles) in rough water.

It should not capsize on a skidding landing or when running with wind abeam at high speed on the surface.

The floats should have a skid-form profile and a sufficiently easy bow to allow of plowing through a moderate sea without undue pounding or wetness.

AIRWORTHINESS.

To have efficient longitudinal, lateral and directional stability in strong and rarified winds up to 30.4 knots (35 miles per hour) and to be capable of banking steeply without danger.

Longitudinal control shall be such as to enable recovery after a steep glide and to enable the machine to readily assume the gliding attitude in case power should fail while climbing.

Proposed aeroplanes shall have initial or natural lateral, longitudinal and directional stability in flight, such that moderate variations from the neutral attitude shall produce positive righting moments without introducing oscillations of increasing amplitudes; any special arrangement of the wings or control surfaces for the purpose shall be clearly described, together with the effects produced.

Inherent or natural stability will be demonstrated by steadying the aeroplane on a path, straight or curved, and then holding the control in a fixed position. Under these conditions the aeroplane should continue to hold its path and trim for an appreciable period without requiring correction or assuming a dangerous attitude.

With Full Load.—A maximum speed of not less than 52.1 knots (60 miles per hour) and not over 60.7 knots (70 miles per hour) is required.

A minimum speed of not over 34.7 knots (40 miles per hour) is required.

A climb of 2,500 feet in ten minutes from leaving the surface is required.

DATA REQUIRED WITH PROPOSALS.

Bidders will submit the following data, *in duplicate,* with their proposals:

1. General arrangement plans of aeroplane.
2. Profile of wing section, with characteristics, stating source of data.
3. Stress diagram for the wings and body.
4. Tabular list of maximum fiber stresses on truss members, together with strength of materials involved, and factor of safety indicated.

NOTE.—A factor of safety of not less than 7 is required.

5. Horsepower curves for full load, horizontal flight, to show (*a*) wings e.h.p.; (*b*) head resistance e.h.p.; (*c*) total e.h.p. required; (*d*) total e.h.p. available. All curves based on knots (1 knot equals 6,080 feet).
6. *Motor Particulars.*—General arrangement plans, specifications, b.h.p. r.p.m. curve, guaranteed fuel and oil consumption, and weight schedule as follows: (*a*) Motor empty, with ignition system and carburetor; (*b*) radiator; (*c*) cooling water; (*d*) propeller; (*e*) starter complete with tank or battery.

Additional information in the form of plans, photographs, catalogues, or other descriptive matter may be submitted if desired.

Spare Parts.—A complete table of spare parts, together with the prices at which the bidder is prepared to furnish each part throughout a period of one year from date of contract, is to be submitted with the bid, but such prices are *not to be included in the cost of the machine* as referred to above. The following is a list of spare parts on which prices are to be quoted as per data required:

(*a*) *Aeroplane Parts.*—Floats, each; upper wing; lower wing; set of struts for one wing; steering rudder, stay wires, each size; turn-buckles, each size; diving rudders; horizontal stabilizers; vertical stabilizers; keel planes; ailerons; control levers or wheels, each type; and items of outfit, etc.

(*b*) *Power-plant Parts.*—Include motor; propeller; crank shaft; cam shaft; starting device; cylinders; valves; pistons; spark plugs; carburetors; magnetos, etc.

(*c*) *Aeroplane tools.*—Include complete set of socket wrenches; spanner wrenches; open-end wrenches; and any special tools necessary for all sizes of bolts and fittings used in the aeroplane; to be itemized.

(*d*) *Power Plant Tools.*—Include complete set of socket wrenches; spanner wrenches; open-end wrenches; and any special tools necessary for the assembly of the power plant and its auxiliaries; to be itemized.

NOTE.—*It is expected that spare parts to the value of* 10 *per cent of the contract will be required with delivery of the aeroplanes. Such additional spare parts as may be required during the year following the date of contract; to be delivered within......days after receipt of order.*

Bidders must insert in the above blank space the shortest time within which they can make delivery.

Delivery.—Upon the satisfactory completion of the specified trials each machine will be put in first-class order and defects corrected. It will then be approved for acceptance.

It is desired to obtain these machines at the earliest practicable date.

Payments.—Payments will not be made until satisfactory plans corrected from work are supplied to the *Navy Department, Washington, D. C.,* in triplicate as follows (1 Van Dyke (cloth) and 2 prints each):

General arrangement plans, scale 1 inch to the foot.
Detail plans of planes, scale 3 inches to the foot.
Detail plans of floats, scale 3 inches to the foot.
General arrangement plans of power plant.
Detail plans of power plant.

Detail plans of propellers, and a complete set of corrected data as required with proposals, and in addition the complete data obtained in the trials of the power plant and of the machine, complete.

The above plans and information should be furnished with the delivery of the first machine, and if this is done the payment for each machine will be made upon delivery as specified.

Detail plans of motor on Van Dyke cloth will not be required if same are already in the possession of the department.

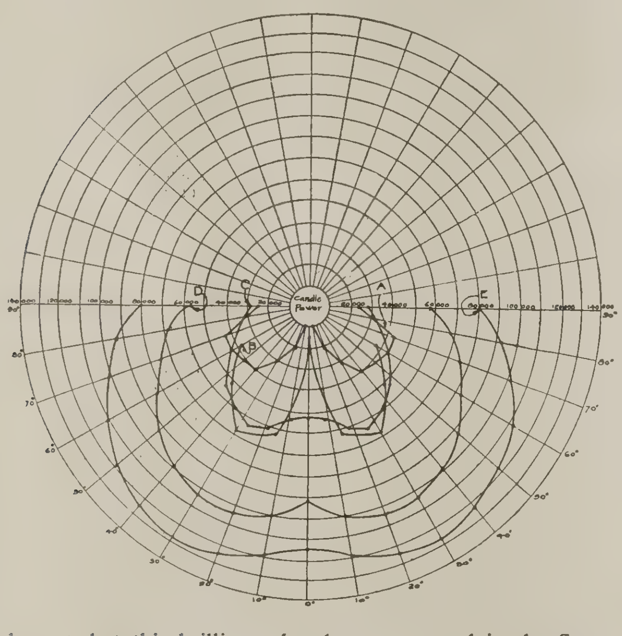
THE SPERRY SEARCHLIGHT

Compiled by Captain Adelno Gibson, Coast Artillery Corps, from Material Furnished by the Sperry Gyroscope Company.

THE development of the Sperry searchlight arc followed a very eventful experience by Mr. Elmer A. Sperry in electric arc work. A great many years ago Mr. Sperry developed an original arc lamp and dynamo, which he had in operation in Cortlandt, New York, in 1879. The succeeding year he operated a larger machine in Syracuse and Chicago. In 1883 Mr. Sperry had a large number of electric arc light installations distributed throughout the west from his factory and headquarters in Chicago. Following this Mr. Sperry has kept in touch with the arc light situation, and now has developed an arc which is showing the highest light intensity.

The one important essential of the projector searchlight lies in the arc source of light, and it has only been recently that any great advancement has been made in this direction. This improvement in the output of the searchlight of a given size lies in the increase of the specific brightness of the light source, which is the brightness per unit area of the light source. It is this tremendous increase of the light source brightness that makes the Sperry lamps so much more powerful than any of the lamps used in the present standard Army and Navy searchlights.

Up to the present the source of light which has been universally used has been the positive crater of a pure carbon arc. This pure carbon crater has a fairly constant brilliancy of approximately 150 candlepower per square millimeter, and it has been considered that this was the highest attainable brilliancy. It is true that this old standard searchlight arc gives the highest brilliancy obtainable from a heat radiating solid, since carbon has the highest melting point of any known

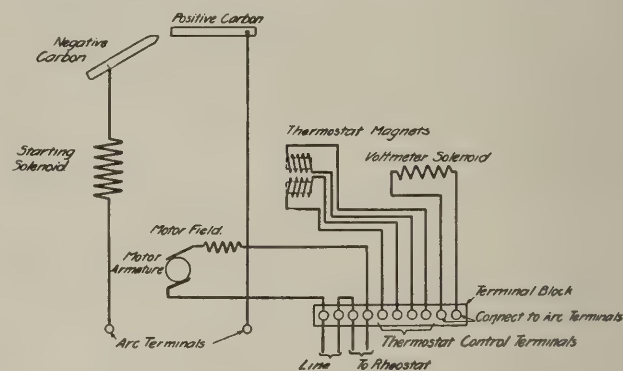


element, but this brilliancy has been surpassed in the Sperry arc by making use, in addition to this heated crater surface, of a superheated vapor or gas produced in the arc. This superheated gas is formed from certain special materials that are powerful light producers and with which the positive carbon is impregnated.

For the successful use of this bright vapor as a searchlight source, it is necessary that it be concentrated in a very small area. This is accomplished in the Sperry arc by maintaining a very deep crater in the positive carbon and into which crater this bright vapor is kept pressed. This vapor causes the mouth of the crater to emit a very intense illumination running even as high as 500 candlepower per square millimeter, or 320,000 candlepower per square inch. The force used to keep the vapor pressed back into the crater of the positive is the arc flame from the negative carbon, and is similar to the arc flame used in the old standard searchlight lamps. The arc flame appears as a flame of considerable velocity emanating from the negative carbon, and gives but very little light in either the old or Sperry type of arc as compared with the positive crater.

The following tabulation of the specific brilliancies in candlepower per square millimeter, and which is rightly taken as the basis of efficiency-comparison for all arc work, shows this tremendous light intensity of the Sperry arc:

1.	Ordinary Tungsten filament..............	2.4 to 5.4
2.	Ordinary Tungsten filament, nitrogen filled.	10.0 to 20.0
3.	Tungsten at the melting point (3500° C.)...	72.0
4.	Arc flame, ordinary white flame arc........	7.0 to 20.0
5.	Surface of crater "spot," flame arc positive.	50.0 to 90.0
6.	Crater surface pure carbon average........	150.0
7.	The Sperry arc being the candlepower of dense positive vapor in deep crater of a two-flame arc, special projector electrode	500.0
8.	Sun at 30° elevation......................	775.0



The very high light intensity of the Sperry arc is also indicated by the curves shown in Fig. 1. Curve A shows the candlepower distribution of the old type 36-inch searchlight lamp with a maximum of 42,000 candlepower throughout a comparatively small zonal angle, and curve D shows the candlepower distribution of the present Sperry 36-inch searchlight lamp indicating a maximum of 105,000 candlepower with a very wide angle of high intensity.

Another great advantage which the Sperry arc has over the

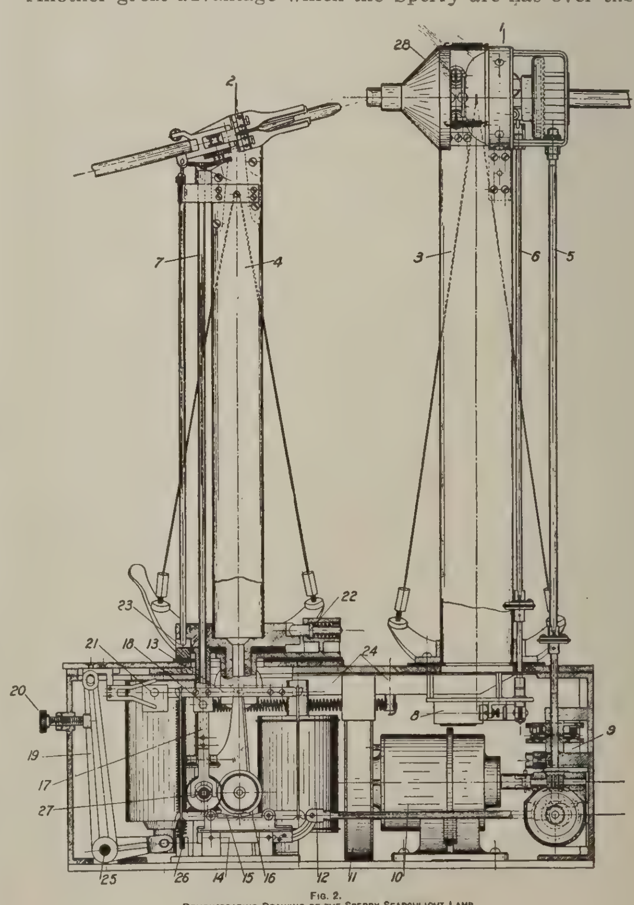


Fig. 2.
Demonstrating Drawing of the Sperry Searchlight Lamp

older form lies in the very great reduction in area of the light giving source or crater. It is possible by using this new type of arc to concentrate the vapor into a crater which has a very much smaller mouth area than heretofore possible with a pure carbon arc of similar amperage. A distinctive advantage results from this reduction in aera of crater, in that the angle of spread of the searchlight beam itself is materially reduced and the beam made much more nearly parallel throughout its length. For the standard 150 ampere arc, the diameter of the positive carbon is only 5/8 inch and that of the crater diameter somewhat less. The diameter of the negative carbon is only 7/16-inch and with its small holder casts a very much less shadow on the center of the mirror, thus, also, adding more reflected light to the beam.

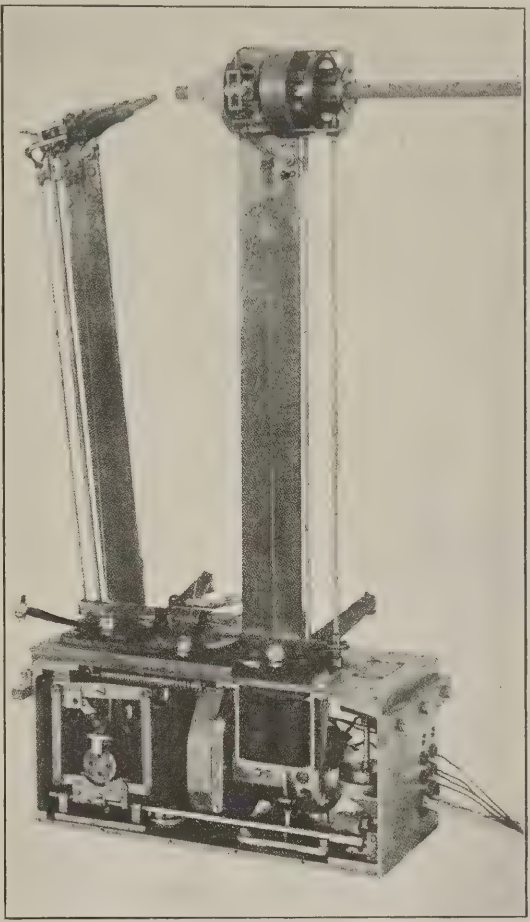
The principle upon which satisfactory operation of this high intensity arc depends now shows itself to be entirely defferent than previously supposed. It was first believed that current density was the principal factor for the operation of such arcs, but we have found out experimentally by current densities ranging from 100 to 1000 amperes per square millimeter that current density is not the controlling factor, but that current value is the important factor.

It is evident that to obtain this highly concentrated light source and at the same time produce constantly a sufficient supply of bright vapor to fill the positive crater, a rapid consumption of the positive electrode is necessary. It is for this reason that the positive carbons are so much longer than those previously used, being 44 inches for the standard 150 ampere arc. In the old type searchlight arc rapid consumption of the positive was not necessary since the gaseous products were not used at all in the production of light, but in the Sperry type of arc this rapid burning of the positive is necessary to provide the light emitting gaseous materials.

The Sperry Gyroscope Company after two years experimenting with this new form of arc, are now manufacturing projector searchlights giving a candlepower intensity at the arc corresponding to that previously shown in Fig. 1 for 36-inch size, and which with an accompaning reduction in the divergence of the beam gives an illumination on the target of six times that formerly obtained with the older type searchlight of similar diameter.

Fig. 2 shows an elevation of the Sperry searchlight. The control box contains a shunt wound motor (10) direct connected to both a centrifugal blower (11) and a gear train for the feeding and rotating mechanism. The blower furnishes air through passage (3) and (4) to the positive and negative carbon holders respectively. The air supplied to the positive holder is forced between a number of heat radiating discs which surround the end of the holder nearest the arc. The cap (28) is open on the upper side to allow the air to escape from the positive holder. This method cools the positive carbon and also removes the heat from the mechanism of the positive carbon holder received mostly by direct radiation from the arc.

The positive carbon is rotated, being connected to the motor (10) through a vertical shaft (5) and a worm gear.



A small crank carrying a crown gear, which engages a gear on the vertical shaft is used to rotate the carbon by hand if necessary.

The positive feed is operated by thermostatic control of the solenoids (8) through the vertical shaft (6). The thermostat is mounted on the drum and so arranged that when the positive carbon burns out of the focal point of the mirror the light from its crater is brought on to the thermostat, causing feed of the positive carbon until the focal point is again reached. This automatic control of positive carbon is also supplemented by hand control.

The feed of the negative carbon is controlled by the solenoid (12) connected directly across the arc and moves the carbon in the proper direction as the voltage rises or falls. The automatic feed of the negative carbon is also supplemented by hand control. A striking solenoid (21) moves the entire negative holder back the proper arc length on striking of the arc.

The entire negative carriage can be turned on the right to permit new negative carbons to be inserted; when so turned, the grip on the carbon is released slightly, permitting a new carbon to be slipped in easily.

The operation of the Sperry lamp is very steady and requires but very little attention after the simple adjustments for length of the arc, speed of rotation of the positive carbon, and the feeding of the carbons have been made. The positive carbon is inserted into the holder by slowly rotating it and pushing it forward at the same time. The negative carbon can be easily put into place when the carriage is swung to one side.

A rheostat is used in series with the arc adjusted so as to get a voltage across the arc of about 75 volts.

(Continued on page 761)

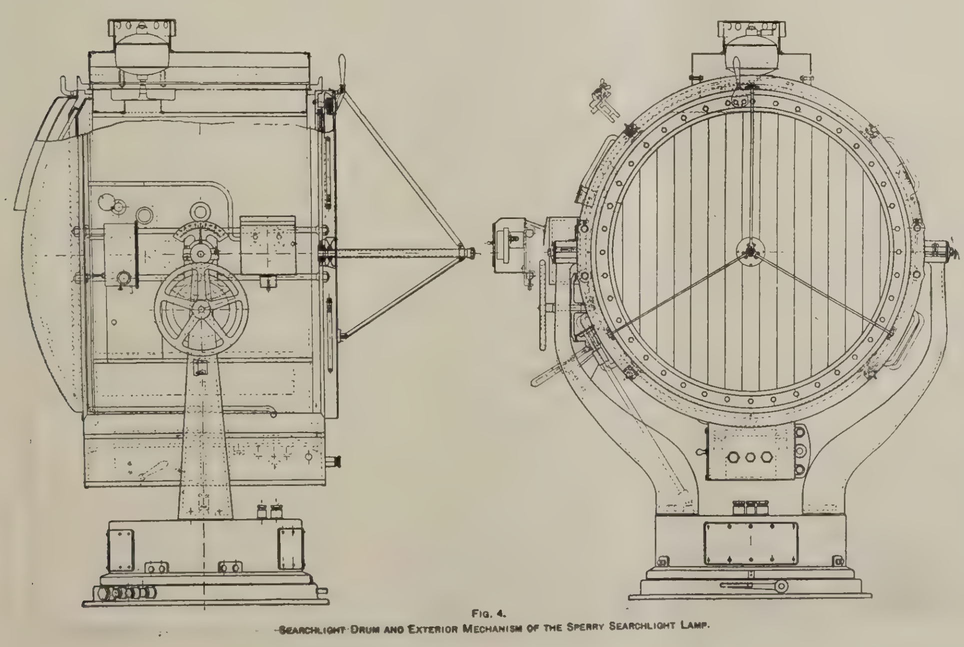


Fig. 4.
Searchlight Drum and Exterior Mechanism of the Sperry Searchlight Lamp.

NIEUPORT SCOUT

THIS speed scout has been doing duty in the French army, and as similar machines are still in the service of the French government, a description and drawings of it have not been available for publication in the foreign aeronautical magazines. The more familiar type of Nieuport is the monoplane, which is noted for its speed, and to meet the demands of modern warfare the Nieuport Biplane Scout was devised, embodying the well-known reliability of the Nieuport practice with features new to biplane construction.

The very narrow lower plane permits of a good range of vision and with only two Vee struts between planes a number of struts and wire braces are done away with. The machine is painted in a peculiar way, with dark and light spots on the planes and fuselage, making it a difficult target when in flight.

Span, top plane	24′-6″
Span, bottom plane	23′-0″
Chord, top plane	3′-11″
Chord, bottom plane	2′-4″
Gap	4′-2″ to 3′-5″
Plane area	145′
Length over all	18′-6″
Motor	Le Rhone 80
Propeller	Helice Levasseur

Planes

The trailing edge of upper plane is on a line with that of the lower plane. The upper plane has a greater chord than the lower and as the leading edge projects about two feet in front of the lower plane, the effect of staggered planes is produced.

Both planes are slightly swept back. The lower has a dihedral of about 8 inches, but the upper plane has no dihedral.

The upper plane, in two sections, is joined at the center of machine. Above the pilot's seat the plane is cut away, so the pilot can easily reach the cockpit, and also making it possible for the pilot to see above, to locate other aircraft.

Wing flaps are recessed in the upper plane, attached to control tubes (indicated on the drawing by short dotted lines), which run through the plane to control arms above the fuselage. Plane covering laps over the leading edge of the wing flaps, eliminating the gap usually found where flaps are hinged.

Each section of lower plane is 10′-5″ in span, set at either side of the fuselage, which is 27″ wide at this point. Attachment to the fuselage is made at one place, 9 inches from the leading edge, where a 2-inch steel tube 7 feet in length extends through the plane from the fuselage to the V struts. Around this tube the strut socket is clamped, with cross wire attachments.

The vertical member of the inclined V strut is 3′-6″ in length, 4 inches wide, with its upper end attached to the rear main spar of upper plane. The inclined member of the strut is 3½ inches wide, attached to the forward main spar of the upper plane. The entire strut is streamline, bound at 12″ intervals with silk ribbon. Upper ends of strut are 34 inches apart. Struts from the fuselage are oval steel tube, 20 inches long. Where they connect with fuselage, they are 30 inches from front to rear struts.

Fuselage

The usual girder box construction is employed, with sides and bottom flat, and the top following the curve of the motor cowl, which is 40 inches in diameter. Vertical members are light T section. Covering back of the pilot's seat is linen, and forward of this 3-ply veneer is used.

The seat is a few inches from the fuselage bottom, and the wide cockpit allows for free movement of the arms. At the seat the fuselage is 33 inches deep and 32 inches wide, tapering to 12 inches high, where the rudder is attached. Where the leading edge of tail plane attaches to the fuselage, the fuselage top is 8 inches wide.

A non-lifting tail plane is 17 inches wide. Tail flaps are 22 inches wide. The distance from tip to tip of the tail flaps is 10′-7″. At the trailing edge of the tail plane a steel tube is hinged, and to this the flaps are attached. There is a space of 9 inches between flaps. The tail plane is supported by steel braces running up from the lower end of the fuselage termination.

A steel tube runs through the rudder and hinges to the fuselage, operated by a short lever arm. No other braces are used to hold the rudder in place.

Landing Gear

V type landing chassis is used, with a steel axle sprung on rubber shock absorbers. Two 26-inch wheels are spaced 5 feet 4 inches apart. Streamline landing members are 4 inches wide, 1 inch thick, with heavy cross bracing cable between. The tops of rear skid struts are placed 30 inches back of the forward skid struts.

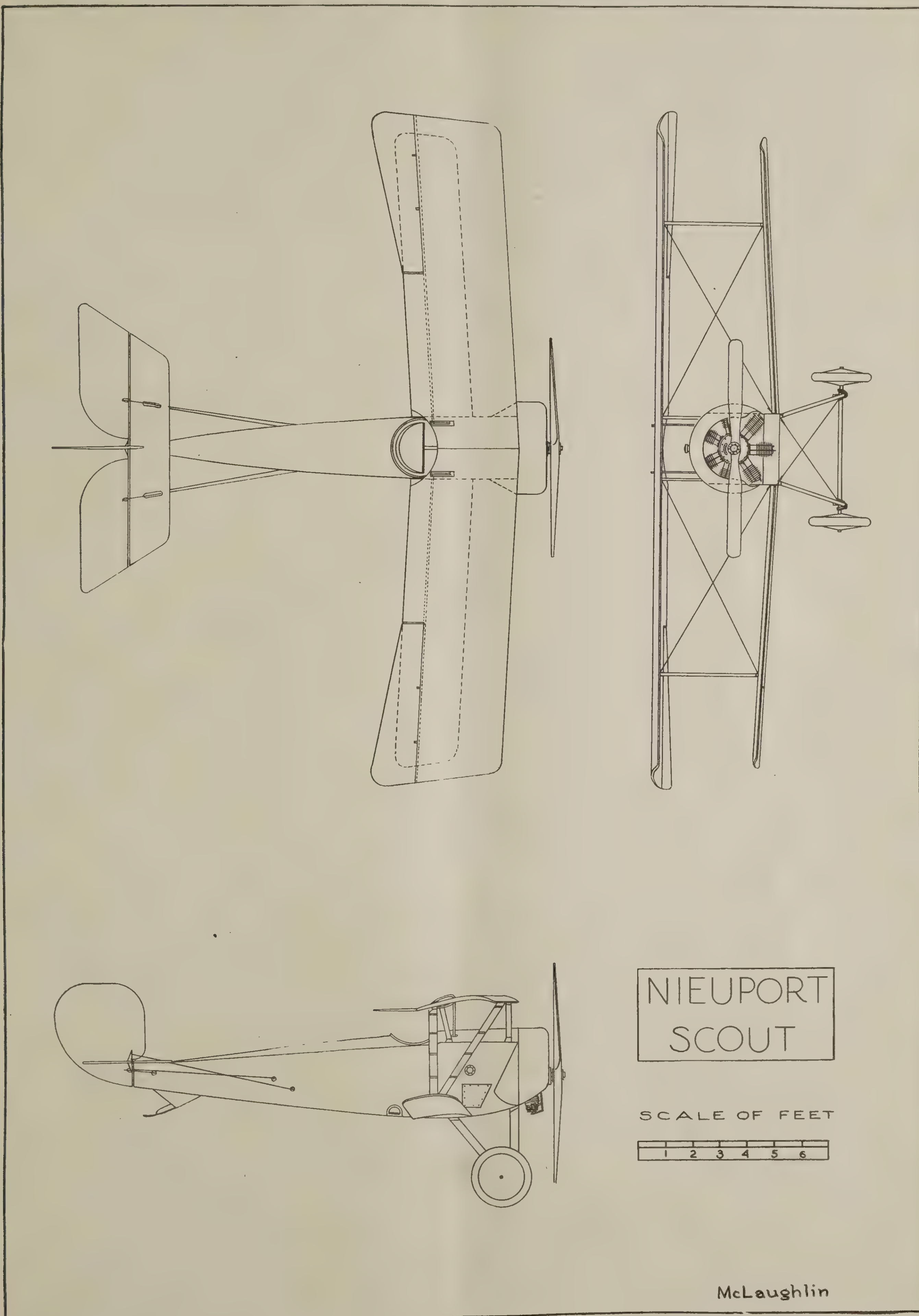
Tail skid is provided with a streamline shield of veneer, as shown on the drawing. The skid itself is ash with a steel plate extension which comes in contact with the ground. The skid raises the end of the fuselage 13 inches from the ground when the machine is at rest.

Controls

Caudron control is used; a single lever in the center of the cockpit, and a pivoted foot bar for the rudder. Forward and backward movement of the lever turns the tail flaps down or up. Movement of the lever from side to side works the wing flaps. This side to side movement is arranged in such a way that it can also be operated by the feet, by means of a foot bar which is entirely separate from the rudder foot bar.

(Continued on page 759)

NIEUPORT SCOUT
Type used extensively by members of the American Escadrille in France


NIEUPORT SCOUT
SCALE OF FEET
1 2 3 4 5 6
McLaughlin

ACCESSORIES

New Spark Plug Tested

The discovery of a new insulating material known as Calorite and its adoption by the Hartford Machine Screw Co., manufacturers of Master Spark Plugs, is a revolution in the spark plug industry. In Master Calorite Spark Plugs, motor owners are assured of a spark plug that will not break under the most extreme heat and cold conditions.

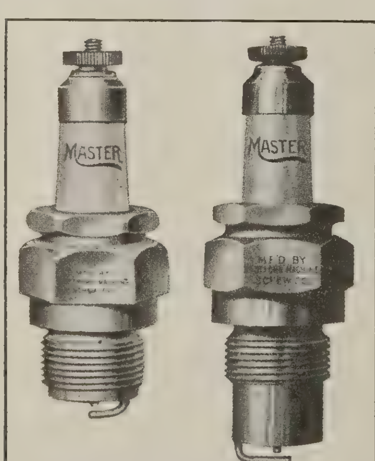
The new Calorite insulator for Master Spark Plugs was adopted only after being subjected to the most terrific tests. The plug was first heated until white hot, then plunged into cold running water, a test so severe that it has never before been attempted. This great instant change in temperature had no effect on the Calorite insulator nor was there any sign of fracture when this alternate heating and cooling was repeated *ten times.*

This terrific test would be enough to satisfy the most exacting minds, yet the engineers wished to try every means of possibly wrecking this new material. To this end, a break-down test was conducted of heating the Master Calorite Spark Plug to a bright red heat and instantly plunging it into cold running water. This alternate heating and instant cooling (a change in temperature of 2,300 degrees) was repeated *twenty-six times without fracture.*

The ordinary porcelain insulator was put to the same test but broke before reaching a white heat and without being put in the water at all.

Calorite was also subjected to a severe electrical test in competition to porcelain, and as an insulating material, withstood a ten per cent higher voltage than the finest porcelain obtainable.

Until Calorite was produced, it was believed that porcelain was the most satisfactory material for spark plug insulators, and the porcelain used in Master Spark Plugs was the finest obtainable. But even the best and most expensive porcelain



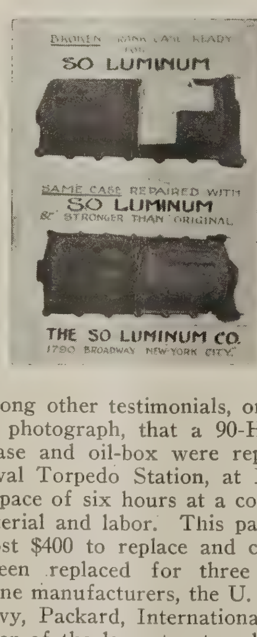
would not stand the extremes of temperature and the high voltage electric currents to which Calorite has been subjected.

With the rapid improvements that are taking place in aeroplane building—creation of more powerful engines, refinements and perfection of design and manufacture—spark plugs must suffer more abuse than ever before.

The old days of broken spark plug insulators are over. Master Calorite Spark Plugs are proof against fracture in service—they won't break when subjected to extreme heat and cold (as proved by the terrific tests just described), and the whole design assures complete freedom from trouble.

Low Temperature Welding Compound

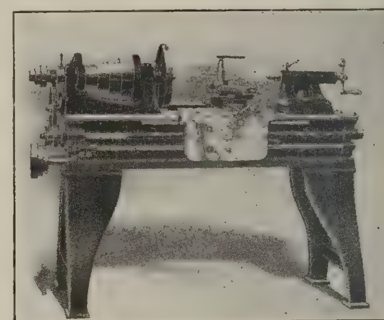
So-Luminum, the newest, great discovery as a welding compound for aluminum, it is claimed by the manufacturers, takes the place of acetylene welding of aluminum and does work which acetylene welding can never accomplish. In the office of the company on a brick, on a table, a lug is frequently built on a manifold pipe as a demonstration in the space of ten or twelve minutes by using a gasoline torch; no flux or tools are required in handling So-Luminum. A flat piece of iron or a hack-saw blade is all that is necessary to tin the parts with So-Luminum and to finish off the built-in portion when the job is completed. The company



has, among other testimonials, one showing, by photograph, that a 90-H.P. Fiat crank-case and oil-box were repaired at the Naval Torpedo Station, at Newport, in the space of six hours at a cost of $27 for material and labor. This part would have cost $400 to replace and could not have been replaced for three months. Aeroplane manufacturers, the U. S. Army and Navy, Packard, International Motor, and other of the largest automobile companies, and some of the largest welding companies are now taking up the use of So-Luminum. Manufacturers claim that, on account of the low melting point of the welding compound, no life is taken out of the metals or parts out of alignment, as is done by 7,000 degrees of heat by using the acetylene flame. The claim for So-Luminum is that it does the work of acetylene in one-fourth the time and cost of acetylene welding. The directions are simple and anyone can follow them out successfully and get results. So-Luminum Manufacturing Company, 1790 Broadway, New York City.

Sebastian Lathes

The 15 inch Sebastian lathe made by the Sebastian Lathe Company, of Cincinnati, Ohio suits admirably for the aeroplane repair shop. It also demonstrates conclusive to the large shop that it pays in time and money to use this machine on small and medium sized

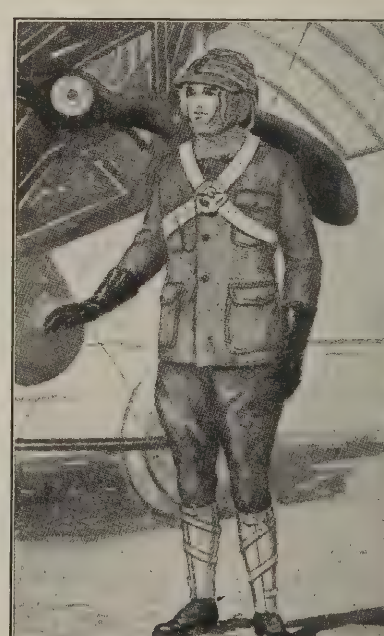


work. It does such work accurately and rapidly, besides enabling the owner to keep his larger lathe busy on its own kind of work. Its weight and stiffness is equal to many a larger lathe. It has screw, rod and power cross feeds and cuts standard threads with furnished gears from 5 to 36.

Spalding Aviation Equipment

Aviators will be very much interested in looking over the Spalding aviation equipment. Leather safety helmets are obtainable at from $6.00 to $10.00, aviation hoods at from 75c to $6.00. A splendid selection of gloves and mittens range in price from $1.00 to $3.50.

The army aviators uniform here illustrated is supplied in army cloth olive drab in color, consisting of coat, army regulation style, and riding breeches, complete for $25.00. A canvas suit, khaki color coat and riding breeches, regulation style can be had for $15.00.



FOREIGN NEWS

GREAT BRITAIN.

The following is the official report for August 25th:

"Two aeroplane raids were carried out against some of the principal railroad sidings on the enemy's line of communication. Several trains were hit and considerable damage was caused to rolling stock. Other points of military importance also were bombed. Hostile aircraft generally avoided combats, but there were some engagements in which a number of enemy machines were damaged and driven down. One of our machines was brought down by the enemy's guns."

On August 24th a fleet of six Zeppelins raided the coast of Great Britain, and while the earlier reports said that no damage was done, it was later ascertained that one of the Zeppelins reached London, where eight persons were killed and thirty-six wounded. This is the first time since October, 1915, that a Zeppelin has been officially reported as reaching London. The following is the official report of the raid:

"Further reports show that five or six enemy airships raided the east and southeast coasts of England. Two or three raiders came in over the eastern counties and dropped over thirty bombs without causing any casualties or damage. Another raider attempted to approach a seaport town, but being heavly fired on by anti-aircraft guns was driven off to the eastward after dropping nineteen bombs in the sea without reaching their objective.

"Another airship which attacked the southeast coast also came under a heavy fire from anti-aircraft defenses and was compelled to unload her cargo of bombs in the sea without doing any damage to life or property.

"Another raider succeeded in reaching the outskirts of London, where explosive and incendiary bombs were dropped, and it is regretted that casualties occurred among the civilian population as follows: Killed, three men, three women, two children; injured seriously, three men, four women; injured slightly, four men, seven women, three children. In addition one soldier was seriously and fourteen slightly injured by glass.

"As far as has ben ascertained up to the present some forty bombs were dropped. Most of these fell either on small property or in the open, but an electric power station was slightly damaged and engineering works were somewhat damaged by fire. Several small fires occurred, all of which were promptly extinguished by the London Fire Brigade, several persons being rescued from positions of danger by firemen.

"Fire was opened on this airship, which immediately altered its course. It is possible that the first airship was followed by a second raider, but this cannot be verified for the present.

"Some of our airmen went up in pursuit and one airman succeeded in firing at the raider at close range. In all one hundred bombs are known to have been dropped by the raiders."

The earlier communication reads:

"Six hostile airships raided the east and southeast coasts of England last night at intervals between midnight and three o'clock this morning. One airship made her way westward well inland. The remainder of the fleet carried out short inroads over the coast. The number of bombs dropped by the raiders has not yet been ascertained. Several bombs are reported to have been directed at ships at sea. The damage effected by the raid was slight.

"In one locality a railway station and some houses were damaged and two horses were killed. At another point two houses were wrecked."

Major Baird, representative of the Aerial Board in the House of Commons, replying in the House on August 22d to criticism of the air defenses during the recent Zeppelin raids, announced that since the war began the Allies had accounted for thirty-five Zeppelins.

"There have been thirty-four raids on England," said Major Baird, "in some of which no casualties were suffered, while in the remainder the number of killed was 334 civilians and 50 military men. Nobody can say that these casualties, deplorable as they are, will have any influence on the conduct of the war, provided the honorable members of the House do not give utterance to such ill chosen statements as have been made in the House of Commons to-night.

"Members of the House of Commons ought to be leaders of the people. They should encourage the people, not create panic. Lord French has a very complete system of air defense, and it is being improved daily, while the British flying corps has a record superior to that of any other nation."

The following is the official report for August 23d:

"When the weather cleared yesterday evening, enemy aircraft, which had displayed unwonted enterprise, were engaged in large numbers with most satisfactory results. The fighting was continuous until dusk.

"At least four hostile machines were destroyed, and many others were driven down damaged and apparently out of control. Others were pursued to their aerodrome. We suffered no casualties. Despite the continual fighting, a reconnaissance was completed successfully, and bombing raids were carried out against sundry points of importance."

Announcement was made on August 26th that British aeroplanes had raided the German defenses in Belgium and dropped bombs on Namur scoring two hits on the airship sheds. Two of the raiders failed to return.

On August 25th, a squadron of the Allies aeroplanes bombarded the neighborhood of Ghent. The first bomb was dropped at 8:20 o'clock and had continued for thirty-five minutes when a terrific explosion was heard. It was thought to be the blowing up of an ammunition factory. An ammunition shed at Mierebeke was blown up and a Zeppelin was seriously damaged.

The following is the official report for August 26th:

"Our aircraft carried out many attacks on points of military importance behind the enemy's lines, dropping in all about five tons of bombs. One hostile machine was brought down and at least one other was brought down in a damaged condition. Two of our machines are missing.

Our aeroplanes bombed enemy camps at Kula Topolca and Prosenik, about six miles south of Demir-Hissar."

Preparations for the repulse of Zeppelin attacks of hitherto unprecedented scope are now almost complete in London because a bitter resumption of the Prussian "campaign of frightfulness" is expected by the British authorities when the daylight hours are shortened. This information was obtained on August 22d from Mr. Gordon Bruce, of the London "Daily Mail," who arrived here on board the Saxonia of the Cunard line. Mr. Bruce said he came to this country on a special assignment for that newspaper.

As an American Mr. Bruce deplores the lack of aerial defenses in this country, and remarked that by proper employment of their aerial observers the naval forces of almost any one of the greater European nations could reduce our Atlantic harbor defenses.

In a speech delivered at Bury St. Edmunds, Lord Montagu, of Beaulieu, former vice-chairman of the joint Naval and Military Board, told of new monster super-Zeppelins which the Prussians are building.

"We have obtained some details of these super-Zeppelins," said Lord Montagu. "The principal features of the craft are a capacity of 2,000,000 cubic feet, a length of 780 feet, a beam of 80 feet, a maximum speed of 80 miles an hour, a cruising speed of 35 miles an hour and a radius of action of 3,000 miles. The engines, six or seven of them, have a total of 15,000 horsepower.

"The airships can carry a load of bombs of five tons. They are able to ascend 17,000 feet. They are armed with machine guns at bow and stern and on top of the envelope. They carry a crew of thirty-five.

"These particulars show how largely the Germans are relying on Zeppelins as a means for harassing us. Two of these new craft have already been completed and four will be available in October."

GERMANY

The official report for August 24th follows:

Near Voche, in the Stenstriz, an enemy biplane fell into our hands. The occupants were taken prisoners.

"An Austro-Hungarian battleplane, piloted by First Sergeant Aridi, in an engagement with four Farman biplanes, shot down two machines. One fell into the sea near Skumbiouth. The second fell into the sea and was recovered by an enemy destroyer."

A German captain of one of the largest Zeppelins yet constructed, when questioned whether he thought the machine capable of crossing the Atlantic to America, expressed his opinion that the feat was possible. He said that of course the weather conditions must be favorable to the attempt. The captain also declared that the newest Zeppelin is capable of reaching every corner of England, Scotland and Ireland, though for some reason or other Ireland was to be exempt from aerial attacks. The correspondent of the New York "World" puts it that "Ireland is to be as free from Zeppelins as it is from snakes." Who knows that in the future the 17th of March will be celebrated in honor of Kaiser Wilhelm as well as Saint Patrick?

The newest Zeppelins are constructed with a multiplicity of cells, making it almost like a honeycomb, which makes them very difficult to be brought down.

The following is the official report for August 26th:

"Two enemy aeroplanes were shot down by machine gun fire in the region of Baupaume and another by the anti-craft guns near Zonnebeke, Flanders, while in aerial engagements one aeroplane was brought down east of Verdun and one north of Fresnes, in the Woevre.

FRANCE.

The following is the official report for August 26th:

"On the whole front our air service was particularly active yesterday. It engaged in a number of fights with the enemy, in the course of which it clearly showed its superiority.

"In the region of the Somme three German machines were brought down, one by Second Lieut. Nungesser, who thus accounted for his eleventh machine. A second aeroplane was brought down by Warrant Officer Dorme, this being his seventh success to date. The third enemy machine fell near Petain. Three other machines were bombarded with machine guns at close quarters by our pilots and descended suddenly in damaged condition.

"Near Craon our anti-aircraft guns brought down a Fokker. North of Chalons a Fokker, which was attacked and pursued, fell inside the German lines, being smashed to bits. In the region of Verdun a German machine was brought down in flames. Near Mogeville two others were hit and went down in a damaged condition, one in the Forest of Spincourt, the other near Foanex. In the vicinity of Pon-a-Mousson a Fokker was put out of action.

"German captive balloons were set afire by our airmen, one north of the Aisne, in the region of Paissy, and the other on the Somme front, near Mesnil St. Necaize. Finally, it is confirmed that on August 23d a German captive balloon was brought down by our anti-aircraft guns and fell in flames toward Bezouveaux in the region of Verdun.

"Last night an enemy aeroplane dropped eight bombs on Baccarat. The material damage was insignificant. One person is reported to have been slightly wounded.

"Norman Prince, of the American squadron, brought down a German aeroplane August 25th. It fell so far behind the German lines that no French observation officer could see it clearly and it could not be recorded officially.

"Chouteau C. Johnson, a New Yorker, son of D. D. Johnson, of St. Louis, who only recently joined the American aviation squadron at the front, attacked another German machine. He got into an excellent position without the German aviator or observer seeing him when the release spring of his machine gun broke and he was unable to attack.

"Some fifty neutral military attaches, including four American army officers, visited the American squadron Wednesday. The American officers dined at the squadron's mess and said the members would be of great service in the United States in helping to build up and instruct the inadequate flying corps of the American army."

The following is the official report for August 23d:

"Adjutant Dorme brought down his sixth aeroplane northwest of Chaulnes. (The earlier bulletin reported the same aviator's fifth machine, making his score two in one day.) Another enemy aeroplane was felled near Roye."

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

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29 West 39th Street, New York City

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9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
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BAY RIDGE MODEL CLUB
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DENVER MODEL AERO CLUB
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BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

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517 Navarro Street, San Antonio, Texas

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MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.

PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Buffalo Aero Science Club

The glider shown in the accompanying photograph was constructed by the members of the Buffalo Aero Science Club. It is 20′ long by 4′ 2″ chord—4′ gap—length, 12′. The main top plane is staggered forward four inches, and the triangular horizontal stabilizer is set at a 4° negative angle, forming a longitudinal dihedral angle of 176°, with the main plane chord. It is a very stable glider and is original with the club. The other picture is of an experimental model constructed by Mr. Wajand of the same club. The main frame or motor base is of two spruce strips ⅛″ by ¼″ by 36″, braced apart by ⅝″ bamboo pieces every 4″. A bamboo pylon is placed in the center and wires trussed on top and bottom to the fore and aft extremities of the motor base. The propellers are not shown, but were two in number, 8″ diameter by 16″ approximate pitch driven by 10 strands each of ⅛″ flat rubber. Main plane—2′ by 4″ at center and 5″ at tips, bamboo ribs and edges with 1/16″ by 3/16″ spruce main beam. The elevator at rear has the same construction and dimensions only it is 12″ wide. The rudder at the rear has an area of 10½ square inches and is of bamboo. The propellers, it will be noticed, are placed behind the main plane, and the propeller bar is 6″ from the front.

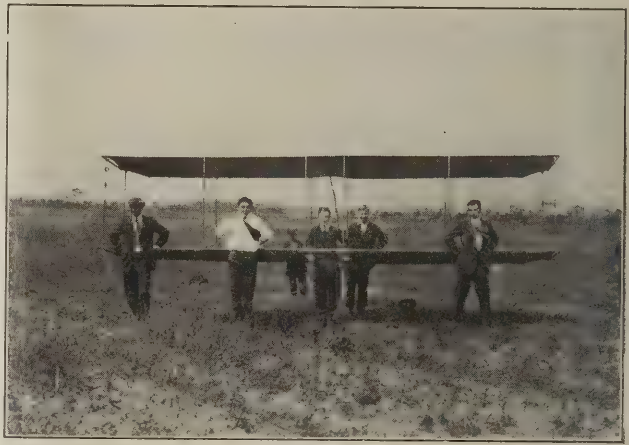
All surfaces are covered with a collodion "dope," and the material used is bamboo fibre fabric.

A lead weight ⅝ of an ounce is placed at the extreme front to complete the longitudinal stability. The model rises very quickly and proves an exceptionally stable flyer.

The design of propellers was a subject talked upon by Mr. Weyand at the meeting of August 13. Bentwood propellers and cambered propellers were compared, and the difficulties in obtaining accuracy in making the bentwood propellers were brought out. The question of building a new glider of the monoplane type was discussed, and it will be finally settled at a future meeting.

Following a motion made by Mr. J. W. Schreier, the former quorom of five members was reduced to four.

The field meets have been successful, excepting several bad smashes. On Saturday, August 19, Mr. Leon Schreier established the first club R. O. G. record, but the model being



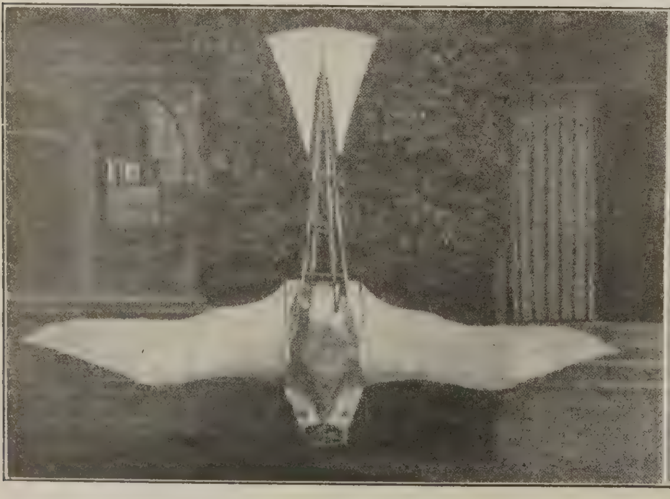
a very light one, was hindered from gaining altitude by a gusty wind. The distance was 553 ft. and 4/5 second duration. A small single tractor monoplane, R. O. G., with a motor base of 13½″ made a duration of 22 seconds, and covered 450 feet distance, at an altitude of about 40 feet. It was made by Mr. Weyand.

Mr. Emil Henrich, a member of the club, has accepted a position with the Standard Aeroplane Company, of Plainfield, N. J.

For particulars, address J. W. Schreier, Secretary, 48 Dodge Street, Buffalo, N. Y.

Aero Science Club of America

At a recent meeting of the club it was decided to hold an officers' meeting every Thursday evening. The reason for this decision was due to the desire to utilize the entire Saturday meetings for discussions. At this meeting (Thursday) membership, publicity and various other matters relative to the interest of the club will be taken up.



The above photographs show a very unique method of wing construction. This extraordinary model was constructed by an English model flyer

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

After Dinner Speech of Congressman J. A. Oskz

(Note:—Mr. Oskz delivered this speech a few days ago before one of the most exclusive clubs of the country. Mr. Oskz, after serving as coroner of Ossawatomie County for thirty years, was elected to the United States Senate. (His three other adversaries were killed in a wreck on election day.)

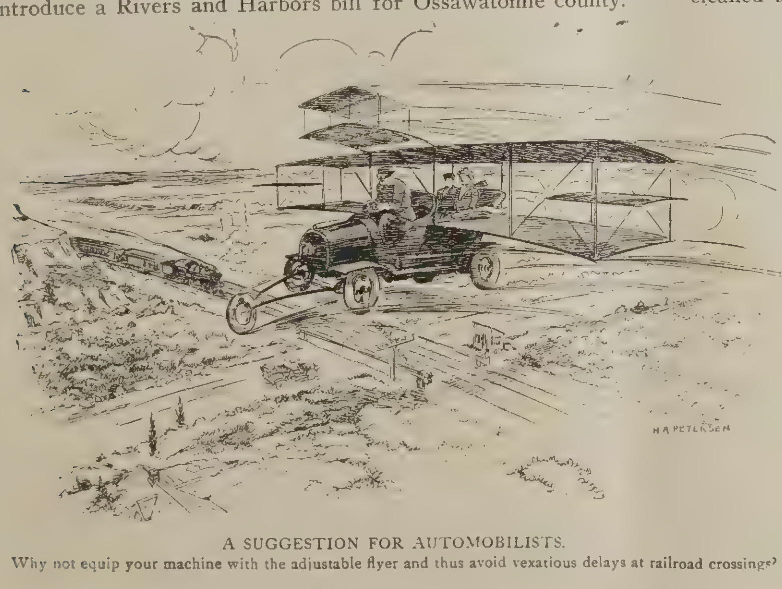
"Gentlemen, I am here at the request of your president to say a few words on my opinion of the possibilities of aeronautics. I shall take only a very few minutes (muffled cheers) for my introduction and then shall proceed with my speech." [The diners with an attitude of helplessness sink back in their chairs.]

"The year 1908—or was it 1809?—was a new era in the life of humanity, for it was in either of these years—I am not sure which—that Claude Grahame-Wright invented the dirigible aeroplane. Before this time flying was impossible, except by the use of opium and the resultant flight of the imagination. I have long been an advocate of aerial preparedness. My voice has been heard in the Senate halls of Washington, from the Orient to the Occident, from the north to the south—my voice has been heard [voice in the back, 'Louder!'] by the crowned heads of Europe and—— [the same voice, 'The dead heads of America'].

"The names of those pioneers in aviation deserve to be mentioned with those of such great Americans as Grant, Lincoln and the two Washingtons, George and Booker T." [Vociferous cheering by the colored waiters.] The conquest of the air has opened up an entirely new field for those scientists who are *thirsty for knowledge*." [Here the speaker illustrated his point by draining a stein of beer.] "The freedom of the air means the freedom of the seas." [The speaker illustrates the freedom of the seas by seizing another stein.]

"In addition to this it presents a new avenue of escape for the thoughts of men, wearied by the commonplace. The escaping bank cashier, wearied by pursuit, can get into his aeroplane and, by the use of air maps, escape the country. [Some bank cashiers in the audience furtively take notes.]

"In conclusion [cheers] let me repeat the words of Kaiser Wilhelm, spoken at the German celebration of the birth of King George of England." [Censored.] At this point one of the waiters mentioned something about "Pork" and the Senator mistook his meaning and, forgetting himself, tried to introduce a Rivers and Harbors bill for Ossawatomie county.



A SUGGESTION FOR AUTOMOBILISTS.
Why not equip your machine with the adjustable flyer and thus avoid vexatious delays at railroad crossings?

No Interruption

Doctor—You will have to give up all mental work for a few weeks.

Patient—But, doctor, in that event my income would cease. I earn my living by writing poems for the magazines.

Doctor—Oh, you can keep right on at that.—*Indianapolis Star.*

Late

Porter (knocking on door)—It's nine o'clock, sir!

Voice of irate gentleman within—Why didn't you tell me before.

At the Concert

Signor Palmoleev (singing Palestrina's Opus 169.4)—Come, Josephine, in my flying machine, going up she goes, up she goes . . .

Frau Z.—Shut off your motor, Palmy; your voice is out of sight already.

Why

"Why do you work so hard?"

"I'm too nervous to steal."—*Puppet.*

Luck

"I see you have a horseshoe over the door," said the Pessimist, entering the hangar. "Has it ever brought any luck?"

"Well, it has tumbled down half a dozen times, and never killed anybody yet," replied the Optimist.

Prayer Needed

Minister (to sick student)—I take a friendly interest in you, my boy, because I have two sons in the university, myself; one taking engineering and the other aeronautics. Is there anything I can do.

Sick Student—You might pray for the one taking engineering.

Just Luck

"How did you contrive to convince your wife you could not afford to own an aeroplane?"

"Pure luck on my part. She wanted to have an old dress cleaned and bought a gallon of gasoline."

Around, All Right

Teacher—Who can tell me the meaning of a "round-robin?"

Bright Boy—Please, miss, it's what that burglar was doin' last night when they nabbed him. —*Boston Transcript.*

Different with the Operators

The following conversation took place in the office of a large motor concern:

"Very few typewriters receive the care and attention that should be bestowed on them," remarked the Old Fogy.

"You must be talking about the machines, aren't you?" asked the Grouch.—*Cincinnati Enquirer.*

"Is that Eddie Jones, the balloonist, with an automobile?"

"I never thought he would succeed."

"He succeeded to a million dollars from his grandmother."

Personal Pars

Harvey M. Harold, who is a graduate of the Curtiss school, starts out the week of August 28 for the Middle West and the South, to fill exhibition dates in his Bleriot monoplane equipped with a Gnome motor. He has had the machine specially constructed for looping the loop. Mr. Harold will be managed by Mr. R. Pease, formerly the Western manager for the Moisant Company.

T. Nakamura, Japanese aviator of Stockton, Cal., has signed a contract for five exhibition flights at Sonora during the Admission Day celebration to be held there September 8, 9 and 10, under the auspices of the Native Sons and Native Daughters of the Mother Lode counties. Two of the flights will be given at night and will be illuminated.

A mile out to sea off Seal Beach, J. J. Edelman, a young New York aeronaut and brother of G. Edelman, who fell 200 feet from his machine at Long Beach Thursday, dropped into the ocean with his balloon at Los Angeles, August 12, and after more than two hours in the water was rescued at a late hour by the lifeguards.

Aviator E. K. Jacquith, with George Goll and Roy W. Black, of Philadelphia, flew from Atlantic City to Cape May August 20 in thirty minutes, which is considered very good time against a strong head wind in a machine carrying three persons.

Robert Glendenning, of Philadelphia, will try for a new record between Philadelphia and Cape May. In order to give Mr. Glendenning a welcome, a party will meet him on his arrival if he makes the flight. In the party will be Joseph A. Steinmetz, president of the Aero Club of Pennsylvania; Daniel Buckley, of the same club, and many prominent yachting men of the local clubs.

Miss Marjorie Stinson will make exhibition flights at the Cleveland Chamber of Industry's exposition September 2 to 9.

On Saturday, August 19, Roy W. Black, a member of the Aero Club of Pennsylvania, and Geo. Goll, a friend, made a flight with Jacquith in his flying boat, from Atlantic City to Cape May and return.

The down trip was made in 30 minutes, and the return trip took about 90 minutes, as we had a stiff breeze against us.

Howard S. Borden, of New York and Oceanic, took a sixty mile flight in his new Burgess hydroaeroplane down the Jersey coast over Seabright, Long Branch and Asbury Park, and as far as Mantoloking. He made the distance in one hour. Mr. Borden drove the machine himself and was accompanied by Clifford Webster.

In the afternoon Mr. Borden flew over to the Rumson Country Club for a polo match game, and during the afternoon Byard Dominick, of New York, was taken for his first flight. After the polo match Mr. Borden flew back to his estate at Oceanic.

A Good Example

The City Council of London, Ontario, has decided to make a grant of $8 per week each to students from this city preparing for the Royal Flying Corps, the grant to operate only after the student has taken his Aero Club certificate.

Nieuport Scout

(*Continued from page 752*)

From each end of the wing flap foot bar, a 1-inch oval tube bar runs up through the fuselage to a lever attached to the tube in the upper plane to which the flaps are connected. In the upper plane, rectangular openings are provided to accommodate the above-mentioned lever.

All openings in the fuselage for control cables are reinforced with aluminum rings, 2 inches in diameter, riveted to the covering. Where flap control cables go through the tail plane, there are slots 6 inches long, the edges of which are protected with aluminum sleeves.

Small and easily removable doors are located at either side of the fuselage, permitting of inspection and adjustment of the control bars situated on the fuselage floor at this point.

Motor Group

An 80 horsepower le Rohne motor is used. This motor consumes .57 lb. of fuel and .094 lb. of oil per horsepower hour. The motor revolves in an aluminum cowl. The propeller used is 8 feet in diameter.

Fuel tanks are situated back of the motor and above the space provided for the foot controls. Gauges for oils and gas are attached to the inside of the cockpit, together with the motor adjustment controls, etc.

(*Continued from page* 751)

The hand control is shown in Fig. 5. This mechanism consists of a small pointer with a handle 6 inches in length mounted above the operating mechanism, which is contained in a small brass composition box of overall dimensions of about 3 inches wide by 3 inches high and 5 inches long with a total weight of about 7 pounds.

In operation of the hand controller, the pointer is kept in the direction to which the beam of the searchlight is to be trained. The vertical and the horizontal training motors are series wound and both have the same system of speed control. By means of a double contact arrangement, two speeds are provided for each motor: On the first, or slow speed contact, resistance is placed in series with the motor armature; on the second, or high speed contact, all the resistance is cut out.

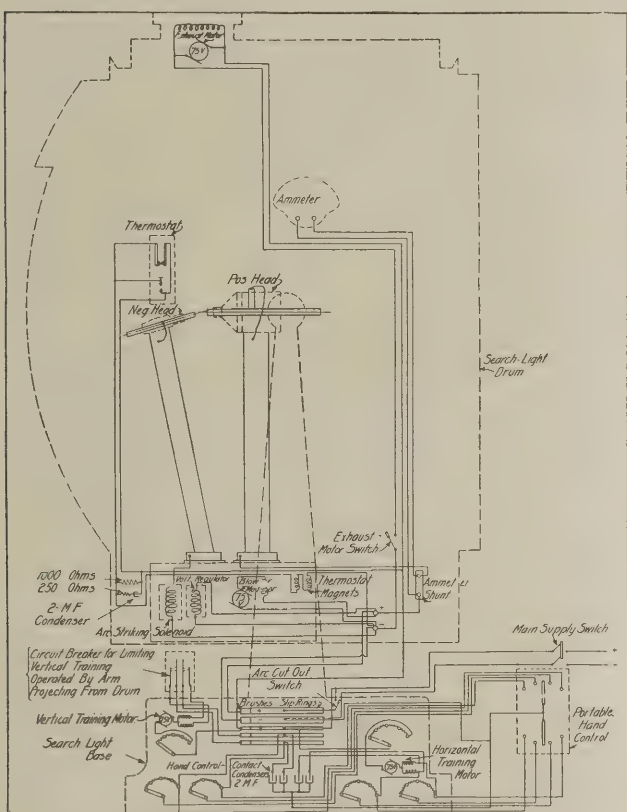


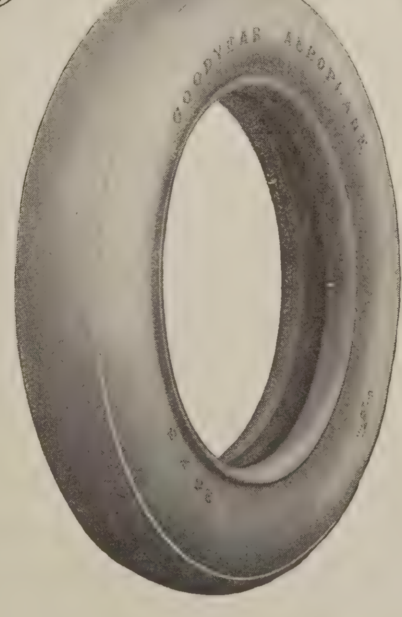
FIG. 5. 1834

The second or high speed is about three times the first or slow speed.

. This controller is connected by an interior communication cable to the operating mechanism at the base of the searchlight, by means of which the drum is turned in azimuth or elevated or depressed, corresponding to the movement of the controller handle at the distant station.

A very important advance in this work has been in the manufacture in this country of carbons suitable for such searchlight arcs. Formerly the only source of supply of carbons suitable for these results was Germany, but after many months of co-operative work between the largest carbon manufacturers of this country and the Sperry Company, the latter is now able to manufacture superior carbons for this purpose.

The Sperry Gyroscope Company, which has developed this arc, is now using it in searchlights of 24-, 30-, and 60-inch diameter. In addition, the Sperry lamps are being installed in old searchlights replacing the old form of arc.



AERIAL AGE WEEKLY

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UNITED STATES MUST BE PREVENTED FROM MAKING MISTAKE ENGLAND MADE

THOSE who have been connected with aeronautics since its infancy know that in the period 1909-1913 aviation in England did not advance because the British Army authorities were obsessed with the idea that they could develop a "perfect" aeroplane, and a "perfect" motor at the Royal Aircraft Factory. While waiting no one encouraged private aeroplane and motor manufacturers and as a result, when the international situation began to grow serious England had to lose much valuable time building a civilian aeronautic industry.

Since the war started the Royal Aircraft Factory has, according to the report of Lord Curzon, chairman of the Air Board, manufactured only 2 per cent of the aeroplanes used by the British Government, and the representatives of the Government, in Parliament, are always careful to emphasize that Royal Aircraft Factory is not, and will not be, used to manufacture aeroplanes or motors.

Another charge which brought about the investigation of the Royal Aircraft Factory was that partiality towards designs made by the Royal Aircraft Factory prevented the military authorities from giving due consideration to better types of aeroplanes and motors developed by private manufacturers.

It was most unfortunate that the Under-Secretaries for War, Colonel Seely, first, then Mr. Tennant, assumed an indifferent attitude towards these criticisms, as towards the general subject of aeronautics. They, like some of Army and Navy authorities, chose to consider criticisms of inactivity "political" criticisms, and did not act. As Mr. C. G. Grey, the British aeronautic authority, points out the removal of Colonel Seely and Mr. Tennant from the War Office was assisted by the state of aeronautical affairs as disclosed by "mere agitators."

The derogatory statements about American aeroplanes and American motors made to the press by Major William Mitchell, assistant to Lieut. Colonel George O. Squier, Chief of the Aviation Section of the U. S. Army Show on attitude of mind which, if shared by the other too-few members of Colonel Squier's staff may lead to disaster. The natural tendency of the heads of an experimental station is to attempt to turn out "the perfect aeroplane." This would be fine were it not for the fact that while the experimentations are taking place the tendency is to let the work of training aviators and equipping them with aeroplanes come to a standstill; and after the "perfect" machines is finally out, those in charge are apt to feel that it is an acknowledgment of inferiority to order better types developed by private manufacturers. And then follows the tug of war which causes strife and prevents progress.

Better a hundred times not to have every government "testing plant" than to go through what England has gone through.

The report of the Royal Aircraft Factory investigating Committee divides the Royal Aircraft Factory into 41 departments; the report of Lord Curzon gives 39 departments.

Royal Aircraft Factory Most Expensive Luxury

Some of these departments, like the Supplies Department are large, this department alone employing as high as 526 people!

The estimate for experimentations alone to be conducted by the Royal Aircraft Factory this year is one million sterling! This does not, of course, include materials used for the spare parts, etc., being turned out at the factory.

Congress has allowed $300,000 for our testing plant, and we encouraged this action—but not to develop a white elephant like the Royal Aircraft Factory!

British Government Allows From Six to Nine Months to Develop a New Type Aeroplane and Ten Months to Prepare to Produce Motors in Quantities

In his public statement Major Mitchell spoke derogatorily of American manufacturers for what he considers inability to make deliveries. The facts in the case are that he did not want what was available and did not allow sufficient time to develop something new.

The report of the committee which investigated the Royal Aircraft Factory states that it takes between 6 and 9 months to develop a new type aeroplane, and Lord Curzon, the Chairman of the British Air Board, states that it takes ten months to prepare to turn out engines in quantities.

Absurd Talk About American Aeroplanes Made For England

Some most absurd talk has been heard about the American aeroplanes which went to England. It is stated that they are "only used for training and for coast defense." The fact is that these machines were ordered to be used for training and for coast defense on designs approved by the British authorities, and the machines were inspected by the British inspectors before shipping. The investigation of the Factory brings out the fact that 2,500 aeroplanes of a "training and coast defense type" were also ordered from British constructors. Why should they order something else when they need a given type? Why buy a three-ton truck when you need the 1½-ton type?

General Evans Organizes Aero Club of Hawaii—To Be Affiliated With Aero Club of America.

Honolulu, Territory of Hawaii, August 23.—A public meeting in the senate chamber, Capitol building, some evening next week will formally launch the Aero Club of Hawaii. Announcement to this effect was made this morning by Gen. Robert K. Evans, commanding the Hawaii Department, who is personally and actively interested in the project and in encouraging aviation on Oahu.

The exact date will be determined after Brig.-Gen. Samuel I. Johnson, commanding the National Guard, returns from a trip to the island of Hawaii on Saturday. The National Guard officials are co-operating with General Evans and his aides in organizing the club.

Headquarters for the club will probably be in the Capitol. General Johnson has offered the use of the armory and Superintendent of Public Works Forbes has offered a room in the Capitol, and the latter seems more available.

The club here will follow closely along the lines of the Aero Club of America, with which it will be affiliated. The initiation fee will be merely nominal, to encourage a large membership of all classes.

"We want this to be a club for all the people, not for any one class," said General Evans today. "It is a patriotic project deserving of public support and any man interested, rich or poor, can join."

General Evans is the first member. His name went on a membership blank this morning.

Application forms for membership have been sent out to various army posts, to National Guard headquarters, to local clubs and to other places where signatures may be received. The applications are simple. They read as follows:

"We, the undersigned, hereby express our desire to become members of the Aero Club of Hawaii, which upon organization and adoption of a constitution is to become affiliated with the Aero Club of America.

"It is not the object of this club to enroll actual fliers only, but all who are interested in the development of aviation, particularly in Hawaii.

"A meeting for organization and election of officers will be called as soon as sufficient numbers have expressed their willingness to join."

An application blank similar to the above is on file at the Honolulu *Star-Bulletin* office and those to whom the other forms are not available may enroll by calling at the editorial department of the *Star-Bulletin*.

A blank is also at army headquarters, Young Hotel.

Announcement is made also by General Evans that all who wish to join but have had no opportunity to do so will be supplied with application blanks at the meeting next week.

Millions for Army Aviation

(Editorial in Atlanta (Ga.) Journal)

The appropriation by Congress of thirteen million dollars for aeronautic service in the Army, the National Guard and the Aerial Reserve Corps is well warranted. No auxiliary of the national defense is more needful than aviation, and none has been so neglected.

When General Pershing's column moved into Mexico, only eight or ten aeroplanes were available for its use; yet they were peculiarly essential to the tasks ahead. In this, as in related matters, the country was fortunate in learning, through a minor adventure, rather than a bitter ordeal, how far short of preparedness it had fallen.

The new appropriation will place army aeronautics on a substantial though by no means imposing basis. Particularly interesting is the provision for the Aerial Reserve Corps through which some three thousand volunteers for air service will be utilized. *Credit for this enterprise belongs chiefly to the Aero Club of America,* which has done a great deal to encourage aviation not simply as a sport and a science, but also as a measure of national defense.

In the European war aviators have played a part no less important than distinctive. The history of the past two years would have moved upon very different lines and either group of belligerents lacked flying machines or skilled, intrepid men to pilot them. Every region and every campaign of the war has witnessed the effective work of the aeroplanes in scouting and range-finding and other invaluable services. It is gratifying indeed that the American Army is to be better cared for in this important adjunct.

Aero Club of America Congratulates War Department on Announcement That It Will Train One Thousand Aviators

TWO thousand civilians and one thousand National Guardsmen who are eager to take aviation training under the direction of the War Department and become part of our aerial defenses, will be advised by the Aero Club of America that the War Department is making plans to train one thousand aviators, only 114 of whom will be Army aviators, as Congress has only authorized that number of aviators for the Regular Army. The rest will be National Guardsmen, who will be trained at the Army aviation schools, and civilians, who will be trained under the direction of the Army, and will form the Aerial Reserve Corps.

Upon learning of the plans of the War Department, the Aero Club of America wired Secretary of War Newton D. Baker, congratulating him upon the splendid plan.

This telegram, which is signed by Mr. Alan R. Hawley, President of the Aero Club of America, says, in part:

"This announcement will be enthusiastically received throughout the country, and you can rest assured of the country's hearty co-operation in carrying the plan to success. It is very gratifying indeed to find that at last the country of Langley, the Wrights, Curtiss and other pioneers in aeronautics, is to take a step towards building an air service commensurate with this country's rank amongst nations."

The telegram also expresses the Aero Club of America's gratification at finding that "the War Department is following the precedent established by European countries in recognizing the International Aeronautic Federation pilot's license as a preliminary certificate to show that the candidate for the air service who has passed the tests required for this certificate has the making of an aviator. "Please send at your earliest opportunity the details about the plan to train a thousand aviators so that we can send the good news broadcast throughout the country. As we have repeatedly advised you, we have about two thousand applications from possible candidates for the Aerial Reserve Corps, and close to one thousand applications from National Guardsmen who are eager to fly. Upon receipt of the details of this plan we shall take great pleasure in notifying these patriotic men and advise them to send their applications direct to the War Department."

Bettering the Air Service

(Editorial in Colorado Springs Gazette)

In one respect at any rate the United States has been aroused to at least a part realization of its deficiencies by the lessons of the European war, and that is in the matter of its military air service.

The aeroplane has been more valuable than any other arm of the service. Only a few months of war had elapsed when a European commander said: "Of all the weapons produced by this war, the aeroplane is the most efficient. It protects, it destroys, it fights. It is the super spy, super scout, super belligerent."

Military men and civilians with a hankering for aeronautics saw the pitiful lack of flying machines and aviators in this country and began an agitation to remedy the condition. Then, just when the public had been aroused to a point where it was ready to be given final proof, came the Mexican trouble, which, more than anything else, has shown up the aviation service of the Army. After that the question was not to arouse the nation, but to intelligently direct the nation's demands.

The Secretary of War had asked and Congress had granted an appropriation of $1,000,000 for the further development of the air branch in the Army. This amount was increased by more than $12,000,000, which fund will be available this year for aeronautics in the Army, National Guard and Aerial Reserve Corps.

The appropriations for the air service of the Navy was $2,000,000. This has been increased to $3,500,000, while still another million and a half may yet be secured for the development of a Naval Reserve.

And there has been authorized the organization of a reserve corps for the Army, in which there will be trained 296 officers and 2,000 men.

The Aero Club of America has played an important part in the work through its National Aeroplane Fund, raised by popular subscription for the purposes of training aviators and purchasing machines. The club has paid and still is paying for the training of some hundreds of men, and it has purchased a large number of planes, many of which have been placed in the service of the National Guard in the various States.

Aeronautics have been given a decided boost in the United States as a result of the war, and it is certain that the interest will be maintained. Perhaps, within a few years, this country will lead the world in the development of the aeroplane, as it should.

The News of the Week

Naval Aircraft Bids Opened

It was found that the Curtiss Company, of Buffalo, had offered the lowest prices when bids were opened at the Navy Department September 5th for thirty hydroaeroplanes for the naval aviation school at Pensacola, Fla. That company offered to construct three for $9,000 each, six for $8,750, nine for $8,500 or twelve for $8,250.

While the types differ from the fighting and scouting aircraft in that the limit of endurance is reduced to meet the requirements for school work only, they must have a speed of sixty miles an hour. As an encouragement to all concerns manufacturing aircraft in the United States it is intended by the Department to divide the awards among those firms whose bids are acceptable under the law.

The names of firms submitting bids issued by the Navy Department were, in addition to the Curtiss Company, the Sturtevant Aero Company of Boston, the Burgess Company, the Aero Marine Engine and Sales Company of New York, the L. W. F. Company of College Point, N. Y., the Thomas Company of Ithaca, the Standard Aeroplane Company of New York and the Pacific Aero Products Company of Seattle.

Navy-Built Hydroaeroplane Tested

The first hydroaeroplane ever built by the United States Navy in her preliminary trial over the Potomac, August 31, appeared to be well balanced and to come up to requirements in every particular.

The machine was built at the Washington Navy Yard and is of sufficient size and strength to carry two passengers, a pilot and observer, beside a 1-pounder gun and approximately 600 pound dead weight. She is equipped with two 90-horsepower tractor Curtiss motors.

Northwest Aero Products Co. Seaplane Tested

First of a number of war seaplanes—the "Number One" seaplane of the Northwest Aero Products Company was launched and given its first air and water tests on August 21 on Lake Union with Aviator Knox Martin in the pilot's seat.

The tests were satisfactory in every respect, giving basis for the belief that when the time comes for government tests each and every one will be complied with, with a big margin of efficiency to spare.

The big warplane is similar in spread and wing area to the Martin Model S seaplane. The dihedral angle in the wings is gone, there is a "hook" aileron on each of the upper wings and none on the lower; there is a difference in stabilizer and elevator surface.

It is powered by a 125-horsepower Hall-Scott upright engine. The landing gear is equipped with two turtle-back pontoons and the body contains space for pilot and observer.

With President W. E. Boeing of the Aero Products Company; Naval Constructor G. C. Westervelt, Aviator Knox Martin, took the big plane out. As a test of her engines he took the plane down the lake to the southern end, wheeled about and in another second was clear of the water and rising rapidly into the air. While testing his controls he performed some pretty evolutions with the big plane, banked under full power to prove there was no sideslip, descended almost to the surface and then mounted at a dizzy angle, half-banked over as a show of the craft's climbing power.

Lieut. Spain on Duty at Chicago

Lieut. W. W. Spain has reported to Captain J. C. Morron in charge of the army aviation centre at Ashburn field for instruction duty. Lieut. Spain was until recently on duty at San Benito, Texas.

To Try 400-Mile Aerial Wireless

Captain Clarence Culver military radio aeronautical expert, attached to the Signal Corps Aviation School at North Island, announced he has perfected an aeroplane wireless set with which he hopes to flash messages more than four hundred miles.

He already has sent messages 120 miles while flying at an altitude of seven thousand feet.

Army aviators claimed another world's record for Captain Culver as a result of his achievement of successfully sending and receiving wireless messages between two military aeroplanes three miles apart and flying at an altitude of one mile.

The sending and receiving instruments installed on both planes each weighed less than sixty pounds, the current for the spark in the transmitting sets being derived from storage batteries.

Export of Aeroplanes

Aeroplanes and parts to the value of $17,850 were exported to Great Britain during the week ending September 2nd.

Audrey Munson Makes Flight

Andrey Munson, the motion picture star, accompanied Allen Loughhead from Santa Barbara across Santa Clara Bay to Catalena Island, where she is working on her next production, "The Girl o' Dreams."

This was Miss Munson's initial flight in a heavier-than-air machine, and judging by the brevity of her costume, she purposed to keep it as light as possible.

"It was the most wonderful adventure in my life," declared the pleased Miss Munson when she landed. Several other California stars have bought their own aeroplanes, and Miss Munson says she will own her own, too.

Miss Lyra Brown Nickerson, of Providence, who died on August 30th, is standing with the officers of the Aviation Corps, Rhode Island Naval Battalion in front of the Sturtevant seaplane which she presented to the organization only a few weeks before her death. Miss Nickerson was enthusiastically devoted to aviation, and the loss of her generous support to the art will be keenly felt.

Mounting of the Hall-Scott "Big Six" in a Glenn L. Martin military tractor.

Aviator in Flight Halts Mortar Fire

Two shots were fired from the mortars at Fort Totten August 24, and then came a lull, although steady firing was expected. An aeroplane was hovering right in the arc of fire, and as the 1,046-pound projectiles rise a mile or so above the earth before beginning to fall, First Lieutenant Edward W. Wildrick gave the order to cease firing until the aviator had sheered off.

Starting at Whitestone, the projectiles traveled over Great Neck, where Mme. Frances Alda was giving a luncheon, and over the William Astor Chanler estate at Elm Point, occupied by Reginald Vanderbilt, splashing into the Sound near Execution Light, off Port Washington. The range was between 5,000 and 7,500 yards. Hits were determined by photographs taken from the tug which towed the target. Reduced charges were used and residents of the neighborhood were agreeably surprised at the mild detonations.

May Shoot Down Planes Crossing Canadian Border

Orders were received August 30 by the Welland Canal guard, patrolling the Niagara Falls district, to fire on any airman venturing over the international boundary. The order comes as the result of two flights made last week by aviator Phil Rader of the Curtiss school at Buffalo, who, after spiralling over the falls, circled over Canadian territory. On one of these flights Rader carried Miss Norma Mack, daughter of Norman Mack, as a passenger.

There is not a gun of the anti-aircraft type in this district, but several will be sent from Toronto headquarters immediately, it is said. As a further precaution to guard the big power plants, the Queen Victoria Park Commission has ordered the embargo on the power house to go into effect September 5.

The Late Miss Lyra Brown Nickerson

Miss Lyra Brown Nickerson, of Providence, died there on August 3 after suffering from typhoid fever for two weeks. Miss Nickerson was a strong advocate of aerial preparedness, and she gave practical expression to her faith by presenting a Sturtevant seaplane to the Rhode Island Naval Militia.

Massachusetts Militia Aviation Squadron in Camp

The two Naval Militia aviation squadrons in Massachusetts are encamped at Mystery Island.

The two squads are a part of the deck divisions of the Militia from Newburyport and Marblehead and consist of an ensign and four enlisted men each. Godfrey L. Cabot is ensign of the Newburyport squad and the other members are to be selected. Norman Cabot is the ensign of the Marblehead squad, and the enlisted men are George R. Fearing, Gordon Balch, Bayard Tuckerman, Jr., and Clifford Webster, the latter a professional flyer for the Curtiss company.

As an idea for summer aero duty is new to the State Militia, the matter has been referred to the Navy Department for suggestions. The Navy Department has replied that it would like suggestions from Chester L. Dane, the commanding officer of the Marblehead Deck Division. Mr. Dane has forwarded to the Navy Department, through Commodore Parker, some suggestions, which, if agreed to by the Navy Department, will permit the holding of the encampment at Mystery Island during the second and third weeks of September.

Thomas Co. Applies for New Mail Permit

The Thomas Aeroplane Company of Ithaca has applied to the Post Office authorities at Washington for permission to establish a mail route between Ithaca and the Fair Grounds in order to demonstrate mail-carrying by aeroplane.

From left to right: Henry Woodhouse, K. B. MacDonald, Dr. A. Francis Zahm, Alan R. Hawley, Judge Monroe Wheeler, Evert Jansen Wendell, Augustus Post.

Lawrence B. Sperry Makes Night Flying Demonstration

The first demonstration of the possibility of water flying at night was given under the auspices of the Aero Club of America, September 1, by Lawrence B. Sperry, the youthful inventor, who flew from Moriches to Amityville, fifty miles away, in pitch dark, lighting his way over the dark waters of the bay with specially arranged lights attached to his aeroplane, and guiding his course by compass.

Mr. Sperry, accompanied by his mechanic, started from Moriches at 8:22 to fly to his hangar at Amityville. His flying boat was equipped with a new night flying outfit, constructed by Mr. Sperry, consisting of three searchlights, each of 53 candle-power attached to his lower wing, two of which were driven by a generator operated by a little windmill connected with the aeroplane. The other derived its power from a storage battery. In this way, if the two operated by the generator should fail, the one operated by the battery would be available, and vice versa. There were also attached to the wing tips of the aeroplane a green light on the starboard and a red light on the port side. After the lights were switched on and the aeroplane started, the machine sped through the black sky with weird effect. The machine, entirely operated by the Sperry automatic pilot, which controls its course and maintains its even keel, covered the distance between Moriches and Amityville in an hour and forty-five minutes, arriving at Amityville at 10:06.

The Aero Club officials consider the demonstration of far reaching importance. Mr. Henry Woodhouse, member of the Board of Governors of the Club, said that this demonstration was so successful that it proves that flying at night can be made as easy as flying during the day. This is another achievement to Mr. Sperry's long list of valuable inventions and accomplishments.

Asks Aero Club to Prepare Aero Mail Map

Mr. Otto Praeger, Second Assistant Postmaster, has asked the Aero Club to prepare for him a map showing the Aeronautical Stations, factories and training camps where aeroplanes could be engaged in an emergency when floods or storms make it impossible to use the ordinary methods of carrying mail.

Aviation Company for Iowa N. G.

Adj.-General Guy E. Logan, of the Iowa National Guard is enthusiastic about the possibilities of forming an aviation section for the troops under his command.

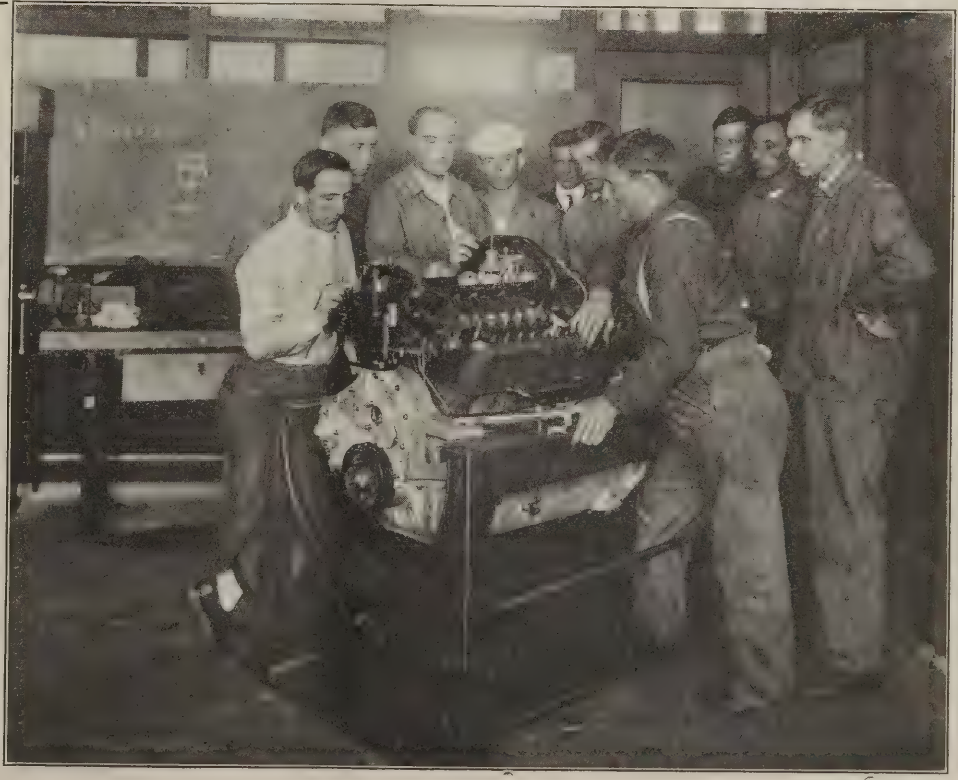
A short time ago adjutant General Logan informed the war department that there are enough men in the Iowa guard eager for aviation to form an aerial company and that he will be willing to take on this branch if the officials desire it. Each company will be equipped with two machines.

Mrs. Richberg Hornsby, the third woman aviator to secure a pilot's license from the Aero Club of America, who is now in the East.

Personal Pars

The engagement of Miss Elizabeth Compton, a Cincinnati heiress, to Lieutenant Mitland McIlrain of Coronado, Cal., an army aviator, has been announced.

Herbert Munter, the Seattle boy whose success as an aviator has brought him great prominence in the Northwest in the last two years, recently made the qualification flights required by the Aero Club of America and, on the recommendation of the official observers, will be given his license.



Students of the Navy aeronautic station at Pensacola, inspecting a Packard engine at Detroit.

INAUGURATION LUNCHEON N. Y. FLYING YACHT CLUB

SIX of the 800 guests who attended the aviation luncheon given by the Harlem Board of Trade, August 31, to celebrate the birth of the New York Flying Yacht Club, came in their flying boats from places distant from the city. This is said to be the first time that guests have gone to a luncheon by the air route.

The first to arrive was Beryl H. Kendrick, who, with his mechanic, J. D. Davis, left Atlantic City, N. J., at 8:30 A. M., and arrived at the Flying Yacht Club station, 129th street and the Hudson River, at 10:30. They made the trip at an average of sixty-five miles an hour, and would have arrived earlier, but they got lost in a fog, from which they emerged to find that they had mistaken Staten Island for Coney Island. Being out of gasoline, they stopped at Perth Amboy for a fresh supply. The boat attracted much attention as it swung up the Hudson and came down off Edgewater, where Kendrick tied up to a buoy under the Palisades.

Lawrence B. Sperry, with Ripley Bowman, was the second to arrive. He left Amityville, L. I., at 12:02 and, circling over Coney Island and Fort Hamilton, came by the Battery and up the river, making the landing shortly before 1 o'clock. As he volplaned to the water both he and Bowman threw their hands up and let the boat make its own landing. The Sperry stabilizer brought it down as softly as the alighting of a feather.

David McCullough came in exactly ten minutes from Port Washington, L. I. With him was Robert Edgren as a passenger.

Thomas P. Fowler, President of the Harlem Board of Trade, was toastmaster at the luncheon, at which Rear Admiral Robert E. Peary, Alan R. Hawley, President of the Aero Club of America; Henry Woodhouse, Governor of the Aero Club of America; F. T. Davison, Captain of the First Squadron of the New York Aerial Coast Patrol; Edward M. Hagar, President of the Wright-Martin Aeroplane Company; Louis H. Fehr, Secretary of the Park Board; Mayor Howland, and several others spoke.

In the centre of the speaker's table was a plaster model of the trophy to be awarded by the Flying Yacht Club to the aviator who wins the around-Manhattan race. Miss Pearl Palmer, who posed for the "Hydroaermaid," which is the central figure in the trophy, posed on the balcony over the toastmaster. It was designed by Alexander Popini, the well known artist.

In his speech Admiral Peary pleaded for the Aerial Coast Patrol. He explained its purposes as the first line of defense, with its aviators patrolling all coasts of the country, and said America would be impregnable if these patrol aeroplanes were supported by enough battle aeroplanes, which could fight off attacking fleets. He was loudly applauded when he said, "We need not tens, not hundreds, but thousands of aviators. We should have an aviator class as numerous as our present chauffeur class."

Mr. Hawley congratulated the Flying Yacht Club on its enterprise and paid Congressman George Murray Hulbert a high tribute for his work in Washington for aerial preparedness.

Following the luncheon, the guests were taken to the flying boat landing station and saw Lawrence B. Sperry take Admiral Peary for a flight, from which they landed with their hands up. Then Sperry took a moving picture man for a long flight, flying around Governors Island, up the East River, under the bridges, and back by way of the Battery.

Kendrick dropped his mechanic and started with Lieutenant J. Homer Stover, of the New Jersey Naval Militia, at 4:55 P. M., for Sea Girt, N. J., where he was to take part in target practice. Lieutenant Stover bore a letter of greeting from Mr. Fowler to Governor Fielder of New Jersey.

As his machine swung down the river, McCullough, with F. Trubee Davison, took the air, and the flying boats went down the Hudson side by side, gradually rising until they passed the Battery at about 1,000 feet. This pleased the crowds that thronged Riverside Drive, and they applauded loudly.

The representative gathering of aeronautic experts and Harlem business men who attended the inauguration luncheon of the New York Flying Yacht Club.

PUBLIC TOOK TO AIR TRIPS AT CURTISS OUTING

Employees of the Curtiss aeroplane and motor factories and members of their families, to the number of about 2,000, participated in an outing at Erie Beach, August 26. Among the features of the day were exhibition flights by Lieutenant Philip Rader in a Curtiss aeroplane and by Walter Lees in a Curtiss hydroplane. There also was an elaborate programme of sports, including baseball and track events. There were fireworks in the evening.

Lieutenant Rader flew from the Curtiss hangar at the foot of Porter Avenue to the beach stadium at about 4 o'clock in the afternoon, with Mrs Rader as a passenger. He then gave an exhibition of spiral gliding over the amusement park, attaining an altitude of about 3,000 feet.

Aviator Lees made several passenger-carrying trips in a hydroplane from the Porter Avenue hangar to the beach, where a landing platform had been built. It was impossible to accommodate all those wishing to take the hydroplane trip.

The officials of the outing were: Honorary President, Glen H. Curtiss; secretary E. H. Cawthra; treasurer, J. A. Callahan; clerk of course, J. L. Callan. The chairmen of the committees were: P. G. Zimmerman, reception and grounds; S. V. Davies, programme and tickets; E. H. Ballard, aviation; M. M. Leeds, sports; Miss R. Niles, women.

Four boats and a number of trains carried the crowds to and from the beach.

Winners of some of the women's athletic events.

The reception committee.

THE BURGESS-CURTISS FLYING BOAT

A SAFE and comfortable flying boat has recently been put through conclusive tests by the Burgess Company at Marblehead, Mass. It is designed especially for the use of sportsmen. A combination of Burgess, Curtiss and Dunne patents have made possible its production.

Absolutely automatic stability is secured by the Dunne system of arranging the supporting surface, a balance which is as certain and as simple as that afforded by the keel of a sailing yacht. In the commodious hull are the well-cushioned seats for pilot and passenger, a handy locker and the main supply fuel tanks. Comfort for the occupants is further provided by wing and spray shields, which provide perfect protection. The motive power is furnished by a Curtiss motor of 100 horse-power.

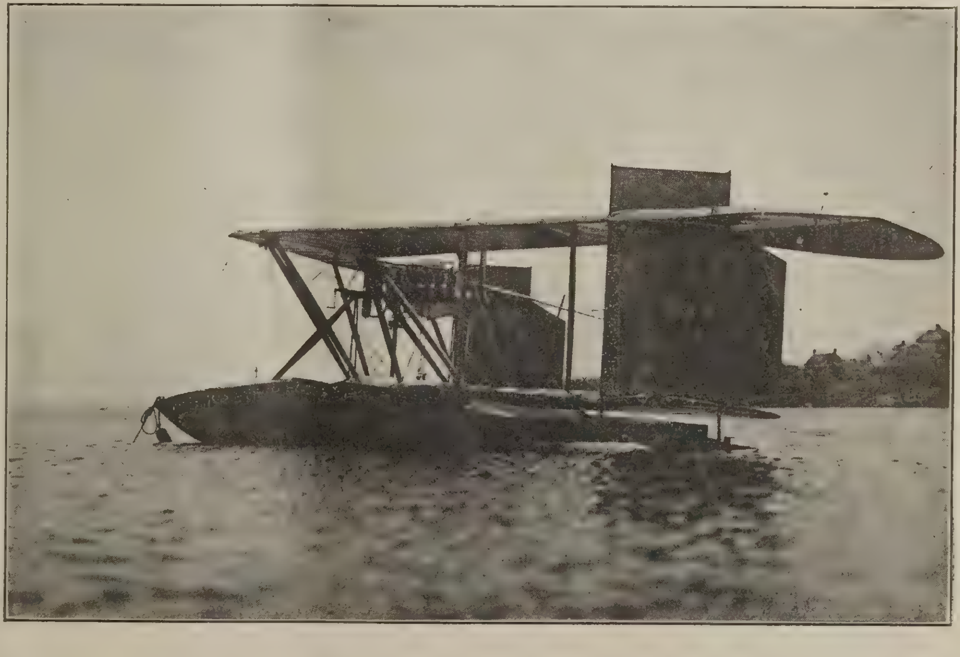
This machine may be used either for flying or for rapid travel on the water. Its speed while in flight is slightly over 60 miles an hour, which on the surface it will reach a velocity exceeding 50 miles.

The possibility of such stability as is afforded by the Dunne system is not generally realized. This means of automatic balance in a flying craft is the invention of an Englishman, Lieutenant J. B. Dunne, who invented it and perfected it at a time some years before the Wright brothers had made their first public flight. Lieut. Dunne began his work about 1900. His first aim was the attainment of an aeroplane which would be self-balancing, and in this he persisted until success had been won. Without the means for carrying on experiments with full-size craft he began on models, of which he made thousands, until he had developed a type which gave promise of fulfilling his ambition.

It then became necessary to obtain support for the furtherance of his tests with full-size machines. He became acquainted with the Marquis of Tullibardine, the son and heir of the Duke of Athol, and it was on his vast estates in Scotland that the full scale machine was brought to perfection and made its initial flight. The secret was most closely guarded at a time when the public scoffed at the possibility of navigating the air, and the grounds where the experiments were carried on were kept secure from intrusion by the Highland kerns of the Duke.

Stability was secured by Lieut. Dunne through the form and disposition of the wing area. The chief characteristic of the system is the harrow or V shape of the entering edge, which, combined with the negative angle of incidence at the wing tips gives the machine its extreme weathercock tendency, and

(*Continued on page* 794)



HOW ONE THOUSAND AVIATORS CAN BE TRAINED WITHIN TWELVE MONTHS

A Plan Drawn By Leading Aeronautical Authorities Which Would Combine the Most Successful European Methods and Practice and Utilize Our Present Resources to Build Our Aerial Defenses

HOW can 1,000 aviators be trained within the coming twelve months? This is a popular inquiry.

The American public has asked that steps be taken to train at least one thousand aviators in the shortest time possible; Congress has allowed an appropriation large enough to do it with; and by co-ordinating the resources available the War Department can have 500 aviators in the advanced military aviation training class by June 30, 1917, when the next appropriation for aeronautics becomes available.

The plan which is given herewith in brief was worked out recently by a group of aeronautic authorities after thorough investigation of our resources and consideration of the most successful European methods and practice.

How 1,000 Men Can Be Obtained to Train

Under the National Defense Act of June 3, 1916, the Army is allowed 114 aviators and can engage as many civilian instructors as are needed. Under this same Act an indefinite number of National Guardsmen can be trained at the Army aviation schools. There are about fifty National Guardsmen under training, and the Aero Club of America has been advised by the Adjutant Generals of the National Guard of different States of between 600 and 1,000 men who are anxious to take the course of training. When the War Department notifies the Adjutant Generals that Congress has provided to train National Guardsmen in aviation the number of applicants will probably increase to 2,000 or 3,000.

The Aerial Reserve Corps, which was authorized by President Wilson on July 13, 1916, upon recommendation of the Aero Club of America, provides for giving commissions to 297 civilians after they have received sufficient training in aviation under the direction of the Army to show that they have the making of military aviators. The Aero Club of America has received several thousand applications from men who are anxious to join the Reserve Corps. An appeal for volunteers would undoubtedly bring several thousand more applications.

There is every assurance, therefore, that there will be more fit candidates for the Air Service than are needed, so we can pass to the training.

One only-third of the men who are trained in aviation usually prove to be adapted for continuous service in military aviation. The other two-thirds are, however, not lost, so their training can be utilized as observers, or in the many departments of the Air Service, such as engineering, motor, repair, and other departments which do not require the manipulation of an aeroplane.

2,000 Candidates Needed to Get 1,000 Aviators

To get the five hundred aviators in the advanced military aviation training class and five hundred in the elementary training class by next summer, the War Department must figure on 2,000 candidates, half of which will be eliminated, mostly during the first part of the elementary class. To get the best results both in efficiency of training and speed, both the elementary and the advanced training schools ought to be operated under the direction of Army officers, utilizing the civilian aviation schools, but operated under the direction of Army officers for elementary training, and establishing regular military aviation schools for advanced training.

Ten Civilian Aviation Schools Available

There are ten civilian aviation schools at present that can arrange to immediately train thirty students each and about five more may arrange to train twenty students each. Figuring only on the first ten, to be safe, by keeping three machines and some good mechanics at the disposal of each instructor, so that he has always a machine ready for flight, and not more than six students are put under each instructor, students can be put through the elementary course of training between six weeks and two months. At the end of this period of time they would be well enough taught in the operation of an aeroplane to pass the tests required to obtain the International Aeronautic Federation certificate which is the certificate recognized in thirty-eight countries of the world, and without which aviators cannot enter sporting events or have their records recognized. Over twenty thousand aviators have received the International pilot certificate in the past eight years, and this long test has shown that the requirements are sufficiently difficult, if passed on an aeroplane of not less than sixty miles an hour speed, to test the candidate's qualifications as a possible pilot.

The European governments do not even require the sixty miles an hour speed minimum. The regulations governing the admission of Canadian applications to the Royal Air Service of Great Britain who have passed the physical examinations, read: "Candidates selected will, on obtaining the Aero Club certificate(issued under the rules of the International Aeronautic Federation) be entered as Probationary Flight Sub-Lieutenants, and will be given first-class passage to England."

War Department Should Take Hazards of Running Schools

The above mentioned civilian schools, which are located in different parts of the country, have advised the War Department and the Aero Club of America that they prefer to have their schools run by the War Department, to having the War Department pay a given sum for the training of each student. The hazards involved in running a school are many, and several firms learned from a deficit of between \$10,000 and \$25,000 that students cannot be given their International pilot certificate for less than \$500 to \$750 each. The following letter from a civilian aviation school to the War Department and the Aero Club of America shows the financial plan of running an aviation school. It must be explained that our War Department proposed, in connection with this, to disregard European practice, and create more severe tests than the International Aeronautic Federation tests.

The following extracts from a letter of one of the firms which operates an aviation school present the arguments which the Aero Club of America heard on all sides when it was proposed by the War Department to shift the responsibility of training the 1,000 aviators on the civilian aviation schools. The letter follows:

"Speaking quite frankly, we have been operating a school for some time at a distinct loss and under the changes which we have contemplated in order to efficiently train civilians for the Army Aerial Reserve, a very material capital outlay would be necessary, which we unfortunately cannot afford, unless the Government assistance of a very substantial nature is forthcoming.

"To give you a close approximation of what a well regulated and organized school for training thirty students at a time, we submit the following:

"School to be operated nine months of the year. Speaking conservatively, under average conditions, it will take twelve weeks to turn out an aviator suitable for your requirements, so that with a capacity for training thirty at a time, it would be possible to train and deliver at least ninety men, during the training season of nine months to one of the three United States Army finishing schools. To keep the machines in proper condition, will require ten mechanics. As 80 per cent of the initial expense or capital outlay will be for the training machines, it is obvious that their cost should be as low as possible. Machines equipped with an 80 H. P. motor with factor of safety 7½ could be turned out for \$6,500 apiece, unless, of course, we set out with the purpose of manufacturing them in quantities at a time, in which case it would be possible to reduce this figure. The cost would therefore be as follows:

"CAPITAL EXPENSE.

"10 machines at \$6,500 each	\$65,000
5 spare motors at \$2,800 each	14,000
Hangars and facilities for small repairs	7,000
Total	\$86,000

RUNNING EXPENSE.

"Depreciation of machines and repairs	\$32,500
5 Instructors at \$125 per week for nine months	22,500
10 Mechanics at \$30 per week for nine months	10,800

(Continued on page 794)

A NOTE ON PROPELLER STRESS

By Dr. A. Francis Zahm

IN the AERIAL AGE for August 7, 1916, Mr. Elmer A. Sperry publishes some estimates of propeller stress which are excessive because based on fictitious premises. In the following table are given the correct premises; also conclusions derived therefrom by Mr. W. P. Loo, M.S., aeronautical engineer of the Curtiss Aeroplane Company.

The propeller in question is of a well known make, as shown in the photographs, and broke at the hub during flight on the Mexican border, in June, 1916. It was used on First Aero Squadron aeroplane No. 70, of the R-2 Curtiss type.

Mr. Sperry assumes that the propeller is deviating in course steadily at the rate of "only" one radian per second. Mr. Loo assumes one-half radian per second, since the fifty per cent lighter JN-3 biplane turns at this angular speed when forced around a perpendicular bank by Carlstrom.*

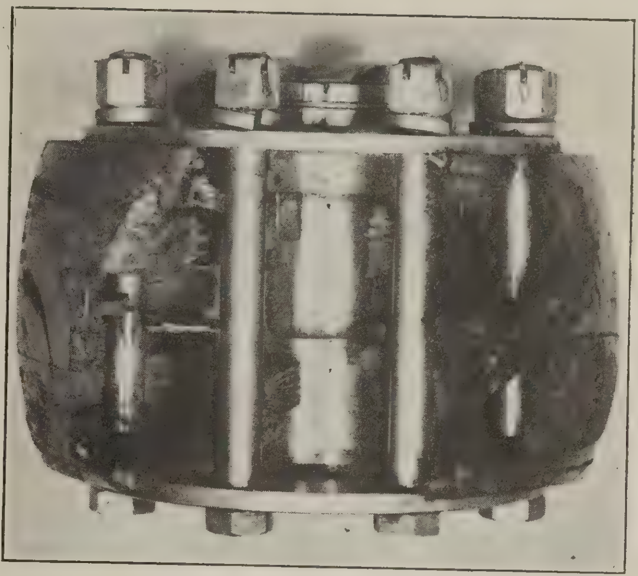
*Mr. C. B. Kirkham reports one-third radian per second as Carlstrom's fastest turning on the R-2 biplane. In England one-third radian per second is considered swift turning.

The weight and moment of inertia of the propeller, which had been shipped to Buffalo by the U. S. Signal Corps, were experimentally determined by Mr. Loo in the Research Department laboratory of the Curtiss Aeroplane Company.

COMPARISON OF PROPELLER ESTIMATES AS MADE BY MR. ELMER A. SPERRY, AND AS CORRECTED BY MR. W. P. LOO.

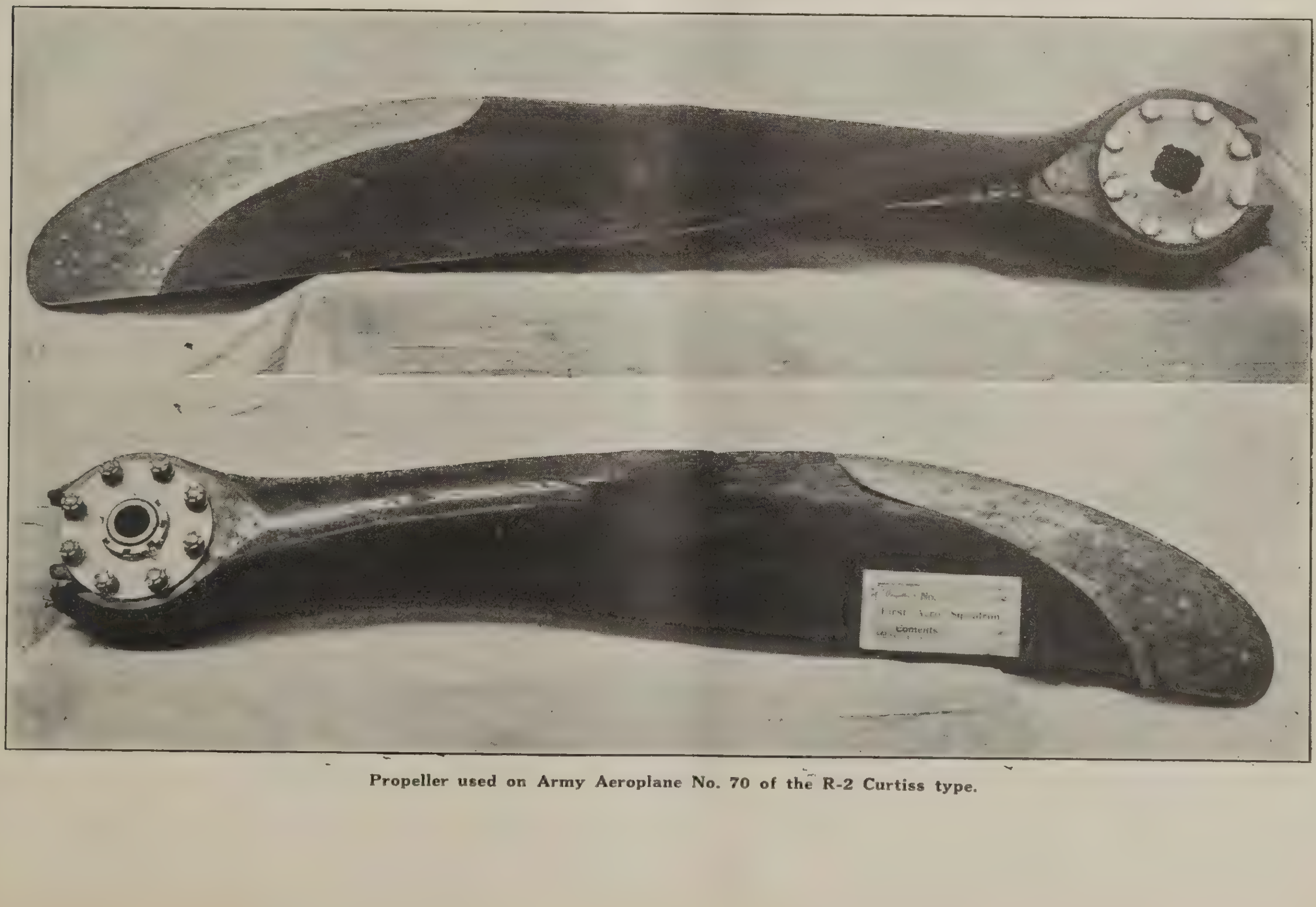
Name of Quantity.	Propeller Data. Assumed by Mr. Sperry	Found by Mr. Loo
Diameter in feet	10.00	9.50
Revolutions per minute	1400	1400
Weight in pounds	65.00	60.00
Center of gravity of blade from propeller axis, in feet	2.28	1.40
Angular velocity of aeroplane, radians per second	1.00	0.50 (Assumed)
Moment of inertia of propeller and metal hub, in lb. ft.		195

	Computed Values By Mr. Sperry	By Mr. Loo
Centrifugal force per blade in pounds	50,000	21,000
Gyroscopic force at the radius of one foot, in lbs.	2750 for two blades	223 for one blade



From the foregoing table it appears that Mr. Sperry's figure, 1,375 pounds, for the gyroscopic force on one blade, is six times that found by Mr. Loo, who made the more careful and detailed analysis.

Mr. Loo's method of computation and experiment was described by me in the *Scientific American Supplement* for March 2, 1912, and applied to finding the gyroscopic torque of a Gnome motor and a Curtiss propeller. In general principle the method is more than a century old. Some interesting applications are given in the Technical Report for 1912-1913 of the British Advisory Committee for Aeronautics. A comprehensive treatment of gyroscopic theory is given in Sir George Greenhill's book on that subject.



Propeller used on Army Aeroplane No. 70 of the R-2 Curtiss type.

THE L. V. G. BATTLEPLANE

ONE of the most successful German machines in European aeroplane races before the war was the L. V. G., and its adaption to a fighting machine seems to have been no less successful. It is said that for fighting and reconnoitering the L. V. G. machines are superior to any that the Germans have heretofore employed.

With its 160 horsepower and speed of 100 miles an hour, it is capable of climbing 6,000 feet in fifteen minutes and 12,000 feet in forty minutes. It is fitted with bomb throwers, flash-signaling devices and star lights, and armed with Lewis machine-guns, which are regarded as the most efficient for air work.

Such a machine was exhibited in New York, and at that time it was possible to secure information regarding it, together with measurements, further data being taken from the English magazine *Flight*. Apart from the backward slope of the leading edge of its main planes, the L. V. G. bears a great resemblance to the Albatross biplane described and illustrated in Aerial Age in the number of December 20, 1915.

General Dimensions

Span, upper plane	43′ 0″
Span, lower plane	39′ 0″
Chord	6′ 0″—4′ 10″
Gap	5′ 9″
Area, main planes	525 sq. ft.
Length over all	27′ 02″
Motor	160-H.P. Mercedes

Planes

Main planes have their leading edge sloping back towards the tip. The chord is therefore narrower at the tips than at the center. The trailing edge is straight. The lower plane is attached to the sides of the body by a quickly detachable device, while the two halves of the top plane are bolted to a cabine composed of four streamline steel tube struts, resting with their lower ends on the top rails of the body.

The interplane struts are steel tubes of streamline section tapered at both ends to take a vertical bolt which passes through the main spar. The anchorage for the bracing cables is very similar to that employed on the Albatross machines and consists of a hollow, cup-shaped steel shell slotted in places to accommodate the turnbuckles of the cables. A quick-release device is employed, which allows of rapid dismantling and erecting without interfering with the adjustment of the wings. The interplane struts are so pivoted on the eyebolt passing through the spar that when the cables are slackened off they can pivot sideways, and the upper and lower planes can be brought to lie flat one on top of the other.

Ailerons, or wing flaps, are attached to the trailing edge of upper plane. An arm is attached to the upper side of the aileron, running parallel to the line of flight, and clearance for its movement is provided for in a slot through the upper main plane. Ailerons have a uniform chord, and each is divided at the center with the outer half set at a negative angle and the inner half conforming to the wing curve.

In the earlier models the ailerons were similar, in that they consisted of two portions, of which the inner was in line with the trailing edge of the fixed portion of the wing, while the outer was set at a negative angle. In this new type, however, the gap between the two halves has been covered with fabric to reduce end losses, and thus rendering the aileron more effective.

The tail plane follows fairly closely along the lines of other German machines, the fixed tail being of large area and the rudder hinged to the rear of a fixed vertical fin. The tail plane is braced from the fuselage by steel tubes.

Fuselage

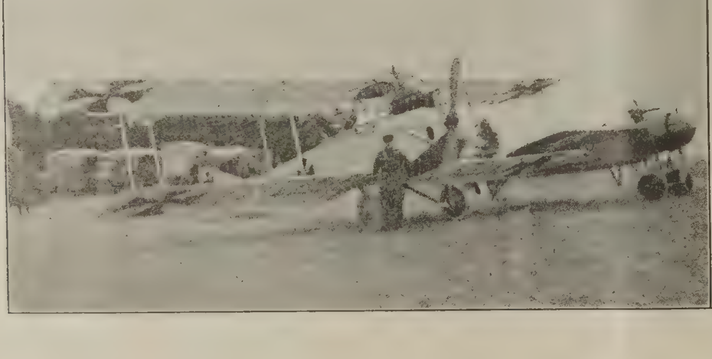
In outward appearance the fuselage of this machine is very much like the Albatross, having the same rectangular section and carrying at the rear a flat stabilizing plane of generous proportions, and in front a large water-cooled Mercedes engine. Constructionally, however, the L. V. G. does not follow the lines of the Albatross, especially as regards the construction of the fuselage. In the Albatross biplanes the body is built up of six rails, one in each corner of the rectangular fuselage, and one half-way up each side. The L. V. G. approaches more the practice followed in England and France, having only four longitudinal rails connected in the usual way by struts and being braced by diagonal wiring.

One of the first considerations in the girder type of body is the selection of a suitable method of fastening the diagonal bracing wires. In the majority of machines built in England the fittings employed for this purpose are of two types—either a steel clip bent so as to surround the body rails and provided with lips for the various wires, or a simple socket into which the strut fits, and which is secured to the rail by one or more bolts. Both have their advantages and drawbacks. The clip form of fastening has the advantage that it does away with the necessity of piercing the rail, but on the other hand, from the pilot's seat back to the stern of the body, each fitting is different from the one adjoining it on each side, on account of the taper which it is customary to give the rail in order to proportion it at every point to the work it has to do. This means extra expense and trouble in the manufacture and erection, and although attempts have been made to overcome this obstacle by keeping the rails the same thickness from front to back, this only lessens the trouble, but does not overcome it entirely, since it entails spindling the rail toward the tail. The other form to which reference was made is not affected by the taper of the rails, but it suffers from the very serious disadvantage that the rails have to be pierced repeatedly.

Fittings on the L. V. G. seem to possess the good points of both forms without the disadvantages of either. The struts and cross members of the fuselage are slotted at their ends to receive the flanges of the fitting. The latter consists of a Duralumin casting. Anchorage for the five wires occurring at each joint is provided by holes in the casting, which is prevented from sliding along the rail by short small wood screws. It might be objected that piercing is not absolutely avoided, but the weakening of the rail due to the employment of two small wood screws for each fitting is in no way comparable in magnitude with that produced by one or more bolts that have to be of sufficient diameter to serve as an anchorage for the bracing wires. Owing to the shape of the L. V. G. fitting, it will be seen that a taper in the rail does not necessitate any variation in consecutive fittings, for if all are made of the same width of the rail at its thinnest end, the only difference will be that towards the front the struts will not have their axes in line with the center of the rail.

From a point between the two cockpits to the nose, the upper rails slope down in a straight line (as seen from the side; in plan they curve in the usual way). The reason for this feature of the machine, one that it has possessed for a number of years, is difficult to discover, unless the idea is to provide for clearance around the lower portion of the engine. The aluminum covering over the top of the body is removable to facilitate access to the interior of the body in the vicinity of the motor.

In the earlier machines of this make all the occupants were accommodated in a common cockpit, but in the latest models, of which the machine illustrated this week is an example, two distinct cockpits are provided, the front one of which is occupied by the pilot, while a gunner is installed in the rear. From this position he commands a fairly free view upward and to the rear, while for firing downwards openings are cut in the top and bottom of the body through which the machine gun may be fired. This disposition of the artillery indicates that the machine is intended for defensive rather than for offensive purposes.



Controls

Seated in the front seat, the pilot controls the machine by means of a foot bar for the rudder, and a lever terminating in a grip or handle, very similar to that of the Morane-Saulnier monoplanes. The lever sticks through the bottom of the body and connects by cables to the aileron bar on the top plane. Cables run from the end of the lever to pulleys located near the outer rear

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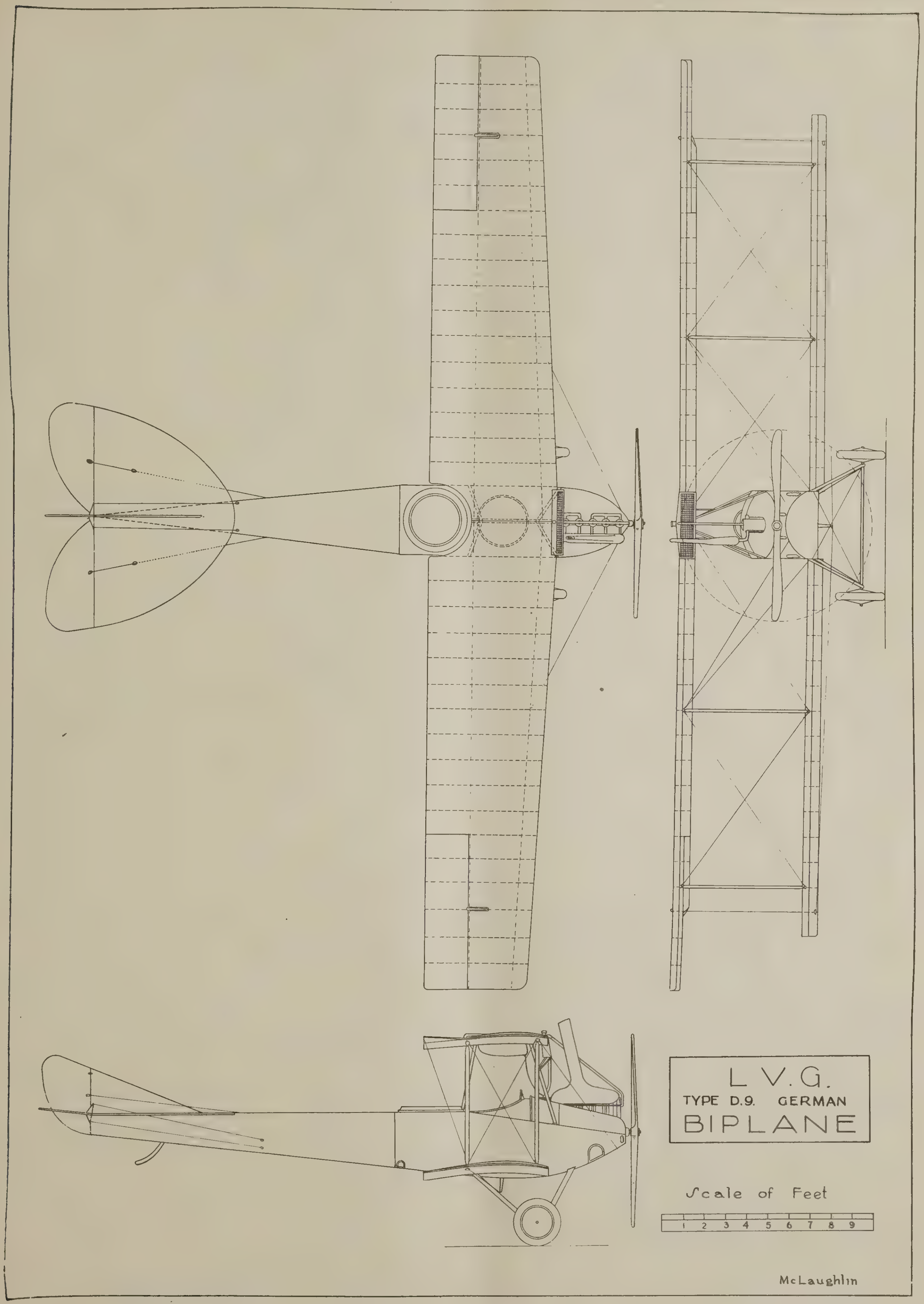

L.V.G.
TYPE D.9. GERMAN
BIPLANE
Scale of Feet
1 2 3 4 5 6 7 8 9
McLaughlin

MERCEDES AERO ENGINE

As the success of many German aeroplanes is due to the reliability of the Mercedes engines with which they are equipped, when an aeroplane is captured from the Germans the feature of its construction that receives most attention is its power plant. One of these 160 H.P. motors was completely dismantled and photographs and sketches made of all its features. It was closely examined and described by our English contemporary "Flight," to whom we are indebted for their interesting information. In the near future "Flight" hopes that investigation by analysis of the materials employed in the construction of this engine will make these available, but until this has been done, is in a position only to indicate what such appear to be when judged solely by the eye—not a very satisfactory method because of the very restricted limits of determination this affords—for which reason every reference to materials made in the following notes must be accepted with the allowances that are necessary under the circumstances.

Obviously the Mercedes engine has not been designed with a view to maximum power capacity efficiency, and this for the very good reason that, the propeller being driven from the crankshaft, high revolution speeds were probably not deemed desirable, since the extra efficiency of the engine obtained by revolutions may be rendered nugatory by the decreased efficiency of the propeller resulting from its higher speed of running.

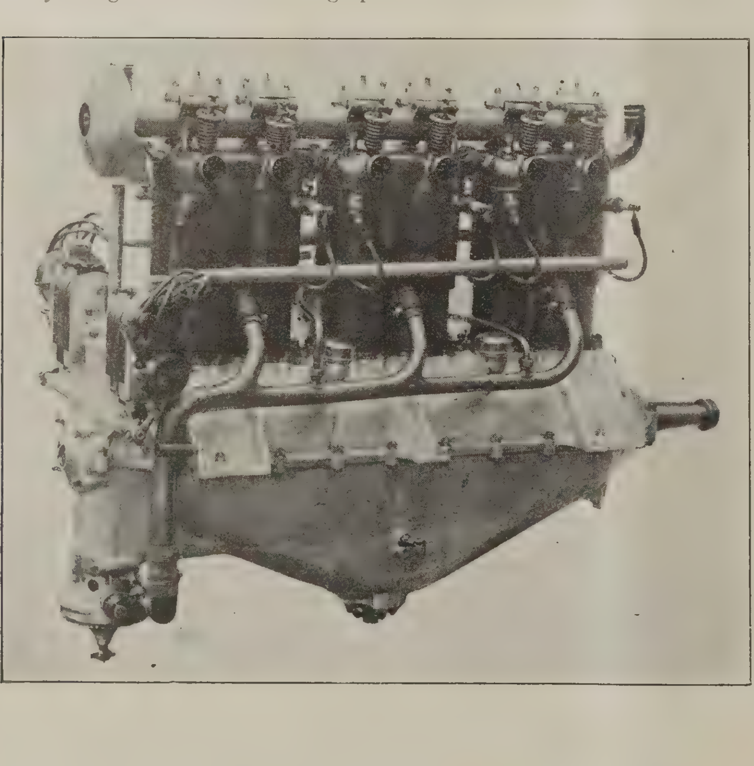
Again, it is possible, of course, that the actual example of Mercedes design that this engine represents is not the latest, and that the engines of this make that are known to give such excellent results are of an improved type. But against this possibility may be set that this engine is practically new, for, except for the damage done to it by shot and shell, there is every evidence on examination that it has been scarcely more than "run-in." For instance, the big end bearings looked as though they had never been disturbed since they had been first fitted, while they were yet so tight as to require a perceptible effort to oscillate them on the crankshaft. From a date stamped on the crankshaft it is probable that the motor was installed in the summer of 1915, and it may be taken as certain that the design of the motor was that which existed at a time subsequent to the commencement of the present hostilities.

The workmanship and finish embodied in the Mercedes are such as to excite admiration, for they certainly are of the very finest. Moreover, it is very evident that reliability almost to the exclusion of all else has been the object sought after. This is revealed by the "heftiness" of every internal working part; even in the reciprocating members little or no effort seems to have been made to cut down weight to an extent likely to influence reliability. On the contrary it is clear the designers have been content to limit revolutions, and by doing so take the advantage permitted to increase the factor of safety, the result being that the Mercedes is an engine comparable with an automobile engine in the matter of infrequent need for attention and overhaul, long life, and unfailing service except for accident.

It must not be thought from this, however, that the question of weight reduction has not received any consideration whatever. On the contrary it has evidently been carefully studied, although this is a fact that is not by any means obvious from the exterior. It is in regard to the parts that may be considered as the framework rather than the working parts of the engine that endeavors in this respect have been directed, especially the crankcase and cylinders, although nowhere has the achievement of the object been allowed to interfere with the rigidity of the engine as a whole, and, therefore, with its smooth running potentialities. That the crankshaft, pistons, connecting rods, valve gear, bearings, etc., are of robust proportions will be confirmed by the figures which will be produced in due sequence.

It is by careful and scientific disposition of the metal that the remarkable result obtained has been made possible in the case of the crank-chamber. The shell itself is extremely thin, but in spite of its length is made rigid, one might say absolutely rigid, by the manner in which it is braced. In the lower half there is a double bottom running nearly the whole length, the space enclosed by it forming the oil sump. A series of exterior longtitudinal fins below the casting not only give stiffness but also serve as radiators for cooling the oil, and while making mention of this fact it may not be out of place to call attention to a further and more interesting duplication of duties that apparently arise in a similar connection, and that is the manner in which the air to the carburetor is also made to cool the oil, and in doing so to become itself warmed as an aid to good carburetion. To this end, the sump does not occupy the full length of the casting, but really forms two compartments in the double bottom, one in front and one in rear connected together by a large diameter tube. Around this tube and between the adjacent end walls of the two compartments, all the air to the carburetor has to pass, there being apertures cut in the side of the crankcase, that lead to the carburetor situated on the other side of the engine.

Reverting to the disposal of material, each of the lower halves of five central bearings for the crankshaft (Figure 6) is supported by a bridge integral with the casting, while in the upper half of the crankshaft each top half bearing is housed in a partitioning wall—or rather in two, since each is in duplicate. Each of them, though very thin, is connected to its neighbor by a solid portion in such a way as to give strength as a whole, while to further reduce weight, large circular holes are left in each wall parallel with the crankshaft. Moreover, each lateral wall, which is, of course, integral with the main casting, is webbed at its junction with the body.



Through the duplex partition long steel bolts, two to each pass downwards, through the bridges in the lower half of the crankcase, beneath which they are held by a castellated nut and split pin. The upper end of the bolts emerge through the top of the base-chamber between each cylinder, and by means of a yoke and a single nut serve as holding down bolts to the cylinder base flanges, no yokes, of course, being used for holding down the outer corners of the flange, of the two extreme cylinders, the bolts here passing through the flanges and taking the nut direct. These long bolts, therefore, take the weight of the bottom half of the crankcase, and serve to bind crankcase and cylinder into a unit. Naturally the two halves of the crankcase are further connected by bolts passing through the faced flanges of each. By this construction a great deal is lost in accessibility, since the engine has to be removed bodily from the aeroplane, and completely dismantled to give access to the main and big end bearings, while even to remove a cylinder the whole of the overhead valve gear has first to be detached. Owing to the infrequency with which attention to the crankcase bearings should be necessary, the first named drawback is perhaps not so important as it appears at first sight, while it gives the advantage of immense stiffness with light weight.

Likewise the cylinders, of which there are six separately mounted, are, considering their size, remarkably light. Apparently these are of cast steel, or perhaps a particularly tough grade of cast iron,

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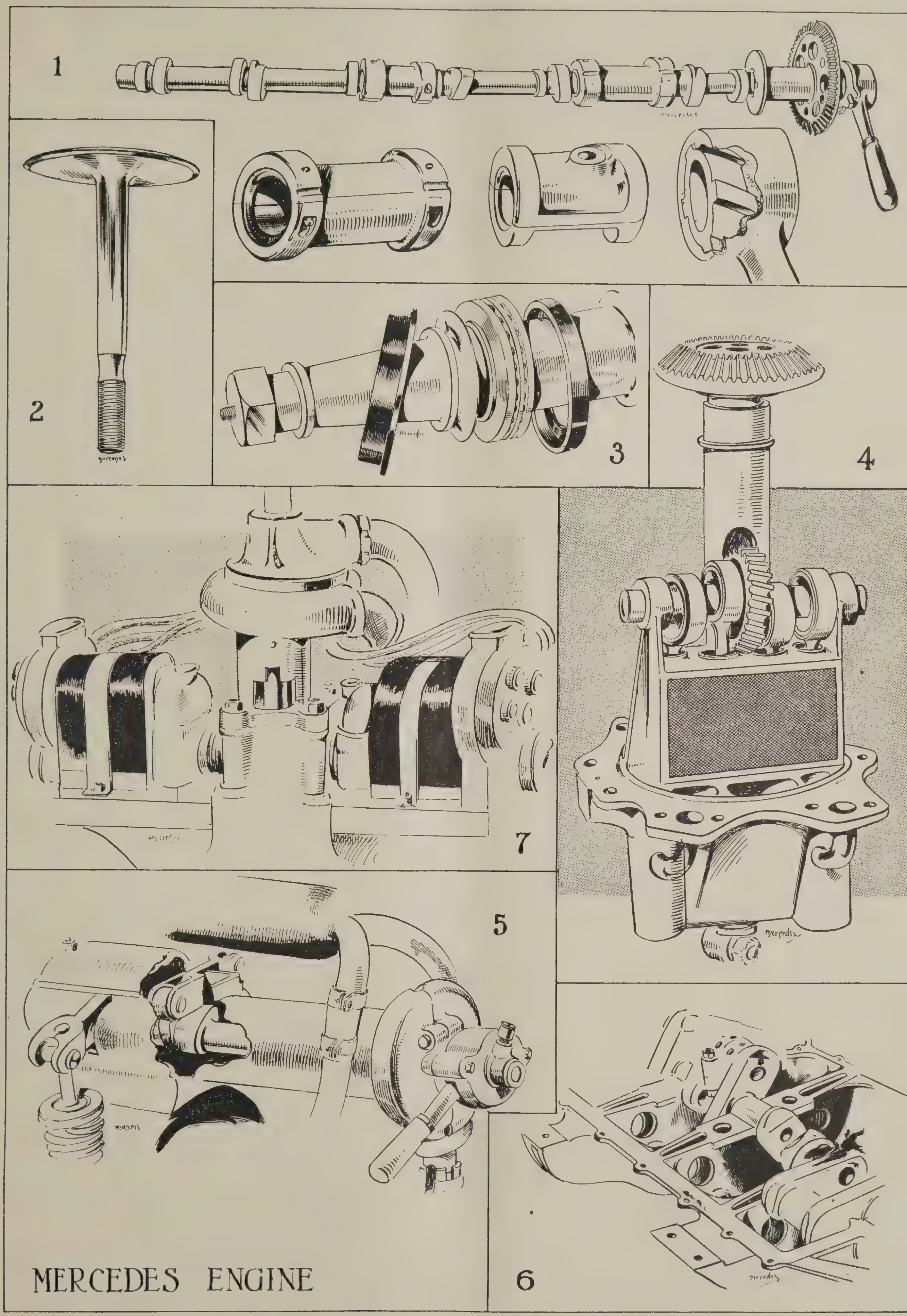


MERCEDES ENGINE

(*Continued from page* 784)

since one was considerably dented—but not cracked or fractured—by shots. In thickness the walls are approximately 3/20 in., and the water-jackets, which are separate, are also of steel, welded on to the cylinders. A complete cylinder with water-jackets, valve springs, two ignition plugs and two water connections, weighs 22¼ lbs., and of this the two valves alone count for exactly the odd 2¼ lbs. Each valve without its spring or spring retainer weighs ¾ lb., but seeing that the diameter of the head is no less than 72 mm. this may be reckoned as quite light. From the accompanying illustration (Figure 2) showing the shape of the valves, it will be seen that no attempt has been made to streamline the under face, or to strengthen it at the junction of the head system, and it might be thought that the valve in consequence was anything but reliable, especially in view of the great tension on the valve springs. However, since maximum revolution speeds are probably not more than 1,200 to 1,250, they are no doubt fully equal to their work, more particularly as the cam profiles are not designed to give more than a moderately quick opening and closing and comparatively small lift. The stem of the valve is 12 mm. in diameter, and is threaded at its end, a retaining collar and nut screwing on to this for placing tension on the spring, these being retained in position by a split pin pressing through stem and nut. The coned face of the valve is narrow, and the stem works in a guide of the maximum length allowed.

Bore and stroke is 140 mm. by 160 mm. so that the valve diameter is slightly more than one-half the bore, it will be observed. This is made possible by the domed head of the cylinder, and slightly recessing the walls adjacent to the head for the accomodation of the valves. No cages are fitted for the valves, the seatings being cut in the top of the cylinder. The water spaces for cooling are here confined to a narrow channel set transversely between the ports.

Perhaps the most interesting novel feature of the Mercedes engine is in connection with the pistons, which are built up of two parts. Crown and gudgeon pin bosses constitute one of these, and the piston walls the other. The former is apparently of steel and the latter of cast iron, the two parts being united by autogenous welding, there being sufficient depth to the skirt of the crown plate for the purpose. The piston heads are slightly concave; there are three compression holding piston rings and one scraper ring at the base. These are of the usual eccentric type, of cast iron, the depth of the ring varying from 3 mm. at the gap to 4.5 mm. at a point opposite. Each ring is 4.95 mm. wide and rides free in its groove, i. e., the position of the gap is not determined by pins. From top to bottom the piston measures 121 mm., its diameter at top being 139.44 mm. and at the bottom 139.74 mm., while it weighs 5½ lbs. complete with its rings. Inside and out the piston is beautifully finished, probably having been subjected to the sand blasting process. The gudgeon pin is hollow, of large diameter, slightly tapered in section, and is secured in place by a simple set screw passing through one of the bosses. Though of hardened steel, the pin does not necessarily take the wear of the connecting rod's oscillation; instead there is a floating steel bushing, freely perforated, riding between the connecting rod little end and the pin itself. The perforations not only allow oil to pass freely from the inside to the outside bearing faces, but also serve to hold a quantity of oil in reserve and to distribute it.

Connecting rods are of H section steel, machined all over, weigh 5 lbs. 14 oz. each, and have a length of 291 mm. Big end bearings are of bronze backed white-metal, having a length of 73.76 mm., the cap being retained by two bolts which are hollowed out for about half this length, presumably for saving weight, while for a similar reason the cap itself, but not the bearing, is much perforated. A bearing length of 71 mm. is provided in the small end of the connecting rod, which is not bushed except for the floating "liner" previously mentioned.

(*To be concluded*)

THE ARMAMENT OF THE FOKKER

IN an interesting article in our contemporary, the *Aerophile,* M. Jean Lagorgette describes the firing mechanism installed in the Fokker. These devices are illustrated in the accompanying diagrams, which depict them as they were installed up to as late a date as June of this year. The great majority of the Fokkers in use by the Germans are single seaters, though by way of exception there exist a few Fokker two-seaters equipped with a couple of machine-guns, one of which is fired through the propeller, the other on the beam.

The pilot therefore is usually alone on his machine, and, so that his hands may have greater freedom of action, there is installed on board a simple device whereby he can lock the elevator control. When this is locked, the pilot can steer to right or left by the action of his feet on the rudder bar and maintain lateral balance by moving the control lever sideways, but he cannot alter his flight path; if the machine was flying horizontally it must continue to fly horizontally and so on until the elevator is freed again.

Steering, therefore, is effected just in the ordinary way, and the lateral control is maintained by the pilot swaying the control lever with his knees; for this purpose the lever carries a projecting sleeve, capable of adjustment, which is gripped by the knees, while the pilot's bucket seat can also be adjusted both horizontally and vertically, as shown in figure 3.

The fore-and-aft movement of the control lever can be temporarily blocked at will in the following manner (see Figure 4):

The control lever pivots around the point "a"; to it is attached the piece "b," which carries the blade "c," which in turn oscillates about the axis "d." The piece "b," and with it the control lever itself, to which it is fixed, can be locked in any position (in the fore-and-aft sense), on the blade "c" by the pilot moving the little lever "e," thereby locking "b" against "c."

The machine gun is of the Maxim type and is immovably affixed above the engine cowl and slightly to the right; consequently it can only be fired through the propeller. Thus it will be seen that the pilot, who is also the gunner, aims not with his gun, but with his whole machine, which makes the task all the more difficult, as both the firing medium and the target are mobile, while the steering of an aeroplane is accomplished by relatively slow movements of considerable amplitude. On the other hand, though a bullet may pierce one of the propeller blades, without causing serious damage, it is obvious that under normal conditions the bullets should preferably not strike the propeller.

In order to fire his gun the pilot presses down a tiny lever fixed in the centre of the control lever (which has a double hand grip) and just below the switch (see Figure 3). A bowden wire transmits this pressure to B (see Figures 5 and 6) and, through the intermediary of the axes F and H of the piece K L M, lowers in front of the piece N the push rod P (running between the guides K and L), and so the pressure at J (where Figure 8 links up with Figures 5 and 6) brings about at the point D the firing of the gun. In this fashion the motion of the contrivance about to be described is transmitted to the machine gun; this contrivance really acts as a clutch, which, when let out, stops the firing of the gun momentarily.

On the engine shaft behind the motor (a rotary Oberursel) is fixed a cam. This single projecting cam is so placed relatively to the propeller blades that the gun is fired through its action (once for every revolution of the engine and propeller) at a moment when neither of the two propeller blades is opposite the muzzle of the gun, in spite of the high rate of revolution of the propeller, which normally reaches some 1,200 r.p.m., or 20 r.p.s. (although the motor may, of course, be slowed down without interfering with the mechanism). The cam raises a vertical push-rod kept in position by a spiral spring and passing through a sleeve (Figures 7 and 8).

The movement of the vertical rod is transmitted to a horizontal one, which in its turn is maintained in position by a spiral spring and can be adjusted by means of a screw (see Figure 3). In this manner the motor indirectly fires the gun. The spent cartridges are ejected through a tube either freely into the air or into a receptacle fitted within the cowl.

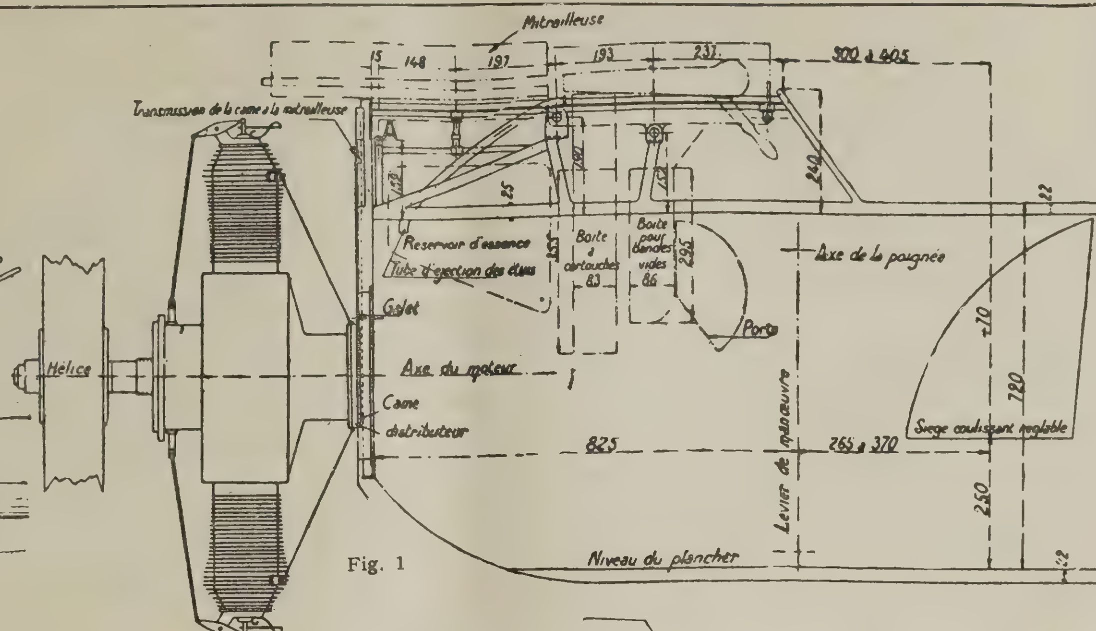


Fig. 1

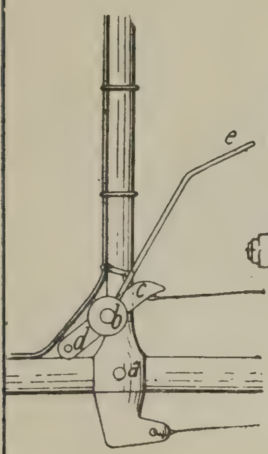


Fig 4

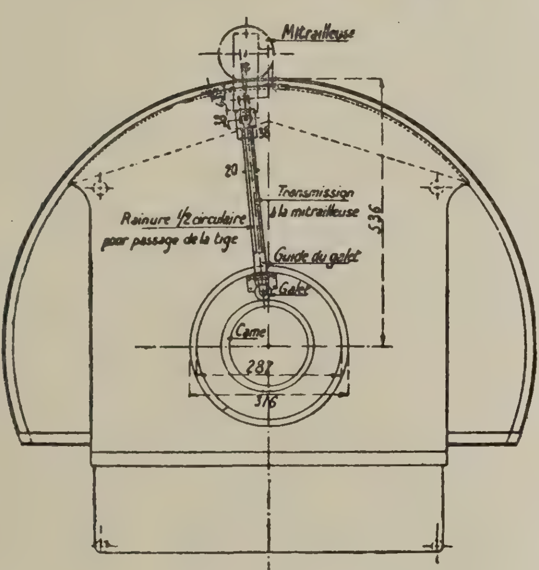


Fig. 7

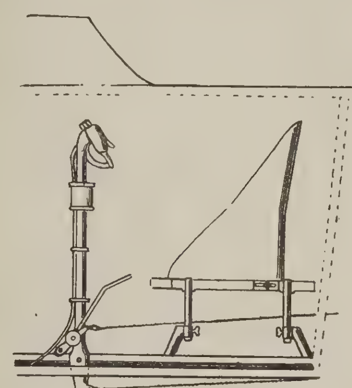


Fig. 3

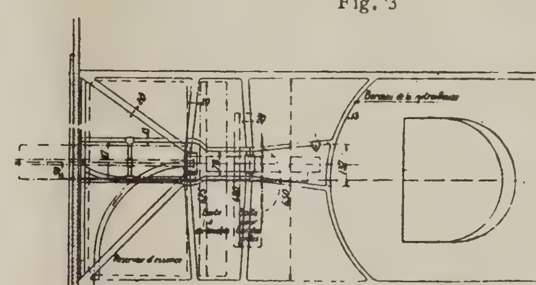


Fig. 2

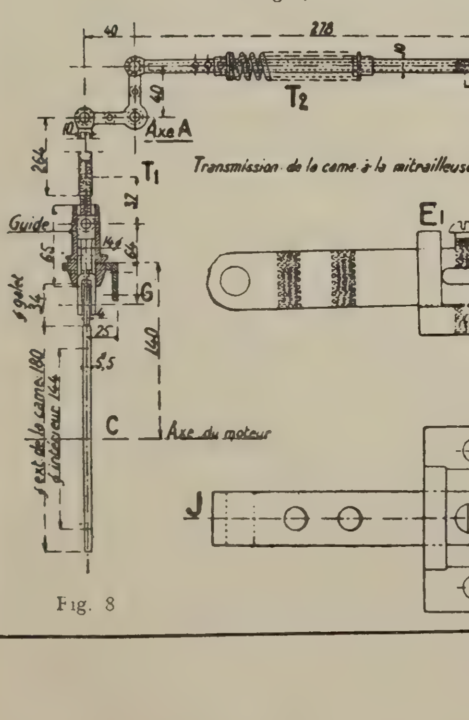
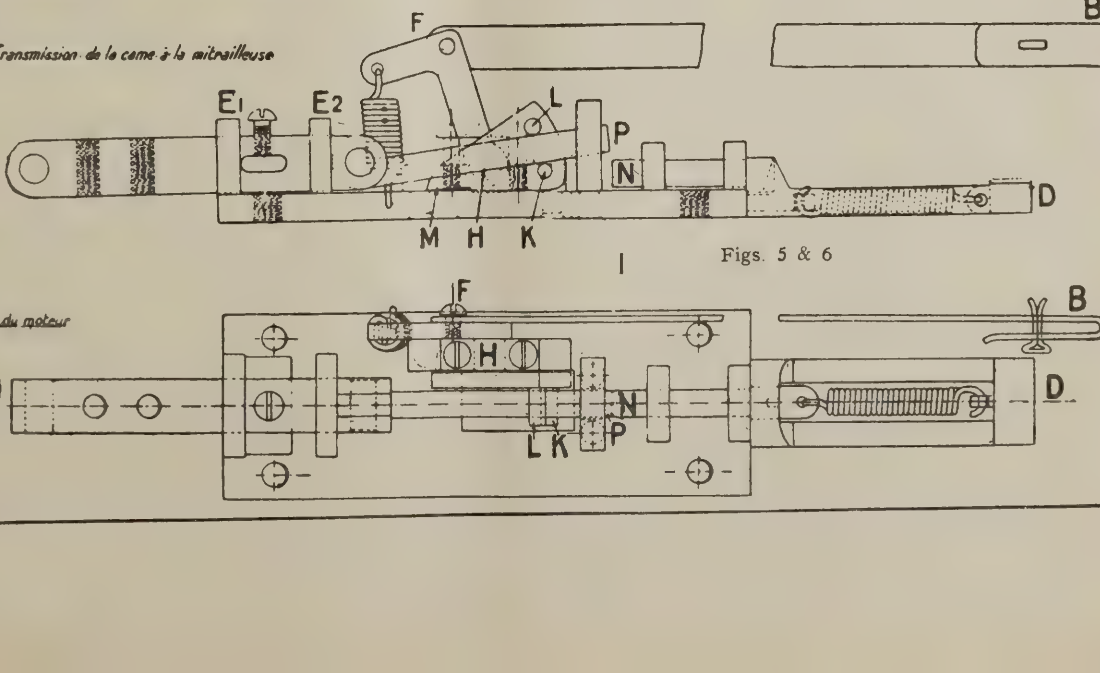


Fig. 8

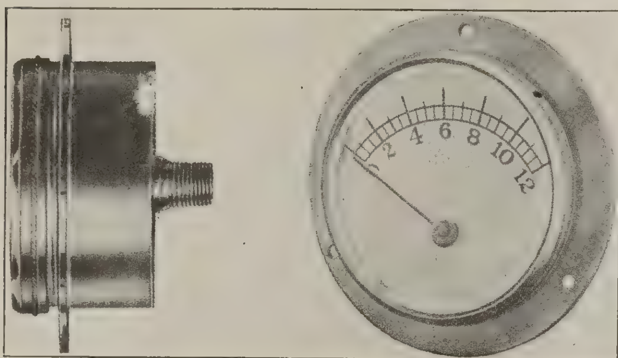


Figs. 5 & 6

INSTRUMENTS

The U. S. Oil Gauge

In the 1913 Design U. S. Standard Automobile dash board pressure gauge, put out by the U. S. Gauge Co., the flange is cast solid to the front part of the case, permitting it to be mounted so that its flange and ring only will project from front of dash.



It is used to show pressure on oiling systems, self-starters, gasoline lines, etc.

Standard Connection ⅛ inch male pipe thread at center of back of case.

The glasses are beveled and fitted with elastic expansion ring to prevent breakage.

Standard graduations: 2, 4, 5, 6, 8, 10, 12, 16, 20, 30, 50, 60, 100, 120, 150, 200, 250 and 300 lbs., and should be graduated to about double the highest working pressure. It is guaranteed to give constant readings while car is in motion; cases—moisture and dust proof; movements—non-corrosive; springs—non-freezable.

The two pressures which are obtained from the use of this nozzle are transmitted to the instrument, which indicates the difference, equivalent to a few inches of water pressure; but, as previously stated, the instrument is calibrated in units of miles per hour, as this unit of measurement is most commonly used in the measurement of air velocities and wind pressures.

The indicator is sensitive, accurate, and positive in its action; dips, dives, or "looping the loop" do not affect its operation.

Although these instruments are made in two sizes, 4" and 6", the use of the 6" instrument is recommended as it can be constructed with a much more substantial actuating element and longer, more open scale, which is more easily read than with the smaller size instrument. The smaller instrument, however, is very accurate and durable and will give satisfactory results and answer the purpose where a small size is required. The instruments themselves can be calibrated for ranges 0 to 100 or 0 to 150 miles per hour. The dials can be supplied with white background with black figures, or black background with white figures. Special ranges can be made to order.

Warner Electric Clock

An electric, or self-winding clock that is right. The Warner is an aeroplane clock that will keep accurate time and give long and continuous service without any attention whatsoever. The construction is such that the winding is accomplished with the least possible consumption of current. This fact allows the use of the ordinary compact, flash-light battery, which makes the replacing of battery, when exhausted, very simple. There are no wire connections to make—the circuit being closed by merely replacing the battery box cover. A fresh battery will last about six months. The clock is fitted with a handsome three-inch dial, with figures etched on metal, in white on a black background.

The time element is composed of a special large sized, seven-jeweled, compensated watch movement, built to our specifications for this particular purpose. The contact surfaces are of coin silver, as this is much better than platinum in this construction. The power is supplied by a light and very flexible spring which is wound less than one-fourth turn. This makes the power so constant that the rate of the clock is not affected.

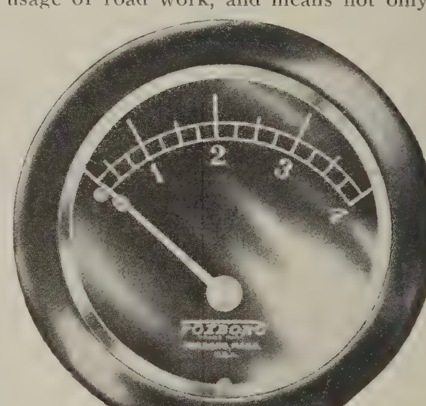
The winding is accomplished by the use of a double coil electro magnet of the "horseshoe" type, with a laminated core of silicon steel, and is provided with a shunt coil to break down the spark at the point of breaking contact.

The armature is of soft steel and is arranged to rotate between the magnet poles. The great advantage of this clock over other electric clocks is its very simple and effective construction, the contacts being so arranged that the electric circuit is closed at one point and broken at an entirely different point, thus making failure of contact absolutely impossible.

Simple and convenient means are provided for setting and regulating the clock. To set the hands, raise the knob and turn forward or back. If clock runs fast or slow remove glass and bezel by pressing in and turning slightly to left. This unlocks the bayonet joint, and bezel may be taken straight off; regulator is in slot at side of dial. Move this regulator slightly up, to make clock run slower, and down, to make it go faster.

Foxboro Indicating Gauges for Oil and Air Pressures

Ever since the introduction of the internal-combustion engine, we have been manufacturing Indicating Pressure Gauges to show the air pressure on gasoline tanks and the oil pressure where forced feed lubrication is used. For automobile work the service calls for a low-range Gauge made to withstand the hard usage of road work, and means not only an instrument which will accurately indicate low pressures, but will stand jars and shocks of travel.



With the growth of the aeroplane comes further demand for this type of instrument, which can be used to indicate the gasoline and oil pressures and will maintain their accuracy under the hard service which they are subjected to, both during flight and while landing, and the Foxboro Co. has developed this type of instrument to a state of perfection where many combinations are offered for both high and low pressures and vacuum, to fit practically any application that is desired.

We illustrate the standard flush type instrument, calibrated for range 0 to 4 lbs. pressure. This Gauge has a dull black finish ring and black dial with white figures, and white pointer. This finish is especially adapted to aeroplane work, as it is unaffected by the weather, and the white figures and pointer against the black background make them very easy to read.

Instruments can be furnished with any range of pressure from 0 to 2 lbs. and up, with the dials having white enamel background or silver background with black figures. Many of the leading aeroplane motor builders are using these instruments and are obtaining excellent results.

FOREIGN NEWS

BULGARIA

"King Ferdinand of Bulgaria," says a wireless dispatch from Zurich, "sleeps in a cellar to avoid danger from airmen belonging to the Salonica armies."

The dispatch adds the King's alleged fear is similar to the "cowardice" he displayed in the Balkan War of 1912-1913, when "he earned the contempt of his staff."

The cellar hiding place is said to be luxuriously furnished. It has a ceiling of bomb-proof steel plates.

FRANCE

Paris, Sept. 3.—Wholesale raids by air squadrons on stations and depots in the vicinity of Metz are reported in the day report of the French War Office. The bulletin reads:

"One of our airmen brought down a German aeroplane which fell close to Dieppe, northeast of Verdun. On the Somme front four more German aeroplanes were badly hit in encounters and descended abruptly in their own lines.

"Our bombing air squadrons carried out numerous operations yesterday with excellent results. Our squadrons twice visited the railway station of Metz-Sablons and threw altogether eighty-six shells of 120 calibre on the buildings and railway tracks. The damage observed was considerable.

"Sixty shells of 120 millimeter calibre also were dropped on military establishments north of Metz. Our aeroplanes bombed the station of Maizieres-les-Metz, Conflans, Sedan, and Audun-le-Roman, as well as the cantonment and depots at Ham, Mesle, Guiscard, Athis, Manchy, and Lagache. In all 210 bombs were dropped in these places.

"A large number burst on the targets and outbreaks of fire at many places were observed."

The following is the official report for September 1st:

Notwithstanding the prevalence of mist and clouds on the greater part of our front, our flying services were particularly active. On the Somme front four German machines were brought down. One of them, fired on with a machine gun at very close quarters by Warrant Officer Dorme, crashed to the ground near Manaucourt. This is the eighth machine brought down by this officer. The other three were brought down southeast of Peronne. Two others fell in a damaged condition in the same region.

In the Champagne an aviator, seriously damaged in an aerial encounter, fell inside the German lines north of Somme-Py. Another enemy machine was forced by the fire of our special guns to land northeast of Somme-Suippes. The two aviators were captured. Finally, near Rioquebourg, a German machine landed within our lines on account of engine trouble. The passengers were captured.

On the 24th and 25th respectively, Sub Lieutenants Deullin and Delatour each brought down his fifth enemy aeroplane.

Second Lieut. Marcel Brindejonc des Moulinais of the French flying corps, who was a celebated aviator before the war, has been killed in the Verdun region. His aeroplane fell accidentally.

A week after the outbreak of the war Brindejonc enlisted in the flying corps and a month later went to the front, where he had since been in service. In October, 1914, he was mentioned in an order of the day for audacity in making a reconnaissance under fire and was promoted to the rank of sergeant. The following December he was made a lieutenant.

His principal reputation came from long distance flights before the war. In August, 1912, he flew from Paris to Warsaw. On that flight his speed was sometimes 106 miles an hour. In 1913 he made a flight across the Channel from Paris to London, and later in the same year he flew from Bremen to Brussels and then again to London. In this flight he covered 100 miles in 55 minutes.

In 1914 Brindejonc flew from Paris to Warsaw and thence to St. Petersburg, making many stops on the return. He alighted at Revel, Stockholm, Copenhagen and The Hague on the way back. He won the third prize in April of that year in the flight from seven European cities to Monte Carlo. Starting from Madrid, he made 880 miles in 14 hours.

Brindejonc was the holder of the Pommery cup, the Geisler challenge cup and the medal of the Academy of Sports.

On August 20, French aviators brought down two German machines.

GERMANY

After vaguely stating that an airship had been brought down on the night of September 2d, "As a result of enemy fire," the German authorities speak of the Zeppelin raid over Great Britain in the following manner:

"During the night of September 2d several naval airship detachments bombarded the fortress of London and fortified places of Yarmouth and Harwich, as well as factories and places of strategical importance in the southeastern counties and on the Humber. Everywhere good effects were observed, both on account of violent fires which broke out and explosions.

"Notwithstanding a strong bombardment all the naval airships returned undamaged. At the same time a number of army airships executed an attack on Southern England."

In reply to the statement made in the British Parliament last month by Major Baird, representative of the Aerial Board in the House of Commons, that since the war began the Entente Allies had accounted for thirty-five Zeppelins, it was said to-day on good authority that only about one-fourth of that number had been lost.

GREAT BRITAIN

On September 2d a fleet of thirteen Zeppelins took part in what is the most formidable raid over England since the beginning of the war. But according to the latest accounts issued the results accomplished were not in proportion to the number of aircraft participating. Only three of the Zeppelins succeeded in reaching London and one of them was brought down in flames. This one appeared over London about fifteen minutes after two (A. M.) and was picked up by searchlights and heavily engaged by anti-aircraft guns and aeroplanes. After a few minutes the ship was seen to burst into flames and fall to the earth. The battered remnants and members of the crew, half burned, were found near Enfield at Cufley. The latest figures on the mortality incurred say that only two persons were killed.

When the news was spread around that a Zeppelin was down, a vast crowd of people hurried to the scene where the police and soldiers were taking bodies from the twisted mass of steel. The Government has issued a request that any one having taking any part of the wreckage away should return it at once, as the authorities wish to study the complete ship as far as possible.

Two more British air raids over Belgium have been made successfully, according to this official announcement:

"On Saturday the ship-building yards at Hoboken, near Antwerp, were successfully bombarded by naval aeroplanes.

"On Sunday the enemy aerodrome at Ghistelles (eleven miles southwest of Bruges) was bombarded with effect by a large squadron of our machines. All returned safely in both cases."

The official bulletin of August 28th contains the information that five of the eight British aeroplanes which were aloft over the German lines, were lost in a sudden storm which swept over southern France on August 26th.

A new lighting order, more drastic than the one now in force, will come into operation on September 1st. All external lights, whether public or private, must be extinguished, except such lights as the Police Commission deem necessary for public safety.

All lights not extinguished must be reduced to a minimum intensity and so obscured that no more than a diffused light is cast on the ground. The internal lighting must be so reduced or shaded that no more than a dull, subdued light is visible from any direction outside and no part of the pavement or roadway or any building or object is illuminated. This new order suggests the official expectation of more Zeppelin raids during the coming dark nights.

A Morning Post correspondent in an East coast port describes a fight which took place at daylight and well clear of the land between a British seaplane and a German airship.

"The story," he says, "was brought to land by the master of a small steamer which had been on duty in the North Sea. When making for port they ran into an area where Zeppelins had been paying particular attention to some British fishing vessels. One of the Zeppelins descended to within a few hundred feet of this steamer as though about to attack her, and while the seamen on board were eager watching a seaplane was seen approaching at remarkable speed and at a very great height.

"Evidently a lookout on the Zeppelin sighted the danger at the same moment, for the gasbag's nose was tilted upward at an acute angle and the propellers revolved at increasing speed, but the seaplane got the first advantage and, as the Zeppelin rose and tried to get away to the eastward, the seaplane dived and came to meet it with a rush which made the men on the steamer hold their breath.

"It looked for a moment as though the airman was going to ram the Zeppelin, but when still two or three hundred feet separated them the airman pulled up sharp and commenced a series of manoeuvres. While keeping his position above the Zeppelin he began dropping shells or fireballs. There was a clearly defined flame as each one dropped, and they fell with wonderful accuracy close to the big raider.

"He had, however, to contend with the guns of the Zeppelin, one on the top deck having got into action the moment the seaplane was within range. The shells from these could be seen bursting around the intrepid airman.

"Some seemed to hit or pass through his planes, and once the crew of the steamship thought it was all over and in the Germans' favor. A shell hit the seaplane near the front. It shook and wabbled, but instead of falling recovered its balance and rose to a higher level, though one of its huge floats was smashed. The little flaming stars continued to rain down to the now fast traveling airship, which was undoubtedly trying to get away, the steamship following at full speed to see the outcome of the fight.

"After about half an hour the seaplane driver scored. One of his projectiles struck the stern end of the gasbag and did considerable damage, for the great machine tilted awkwardly and began to fall rapidly.

"'She fell so fast and so low,' added the master of the steamship, 'I made sure she would drop in the water right ahead of us.

"'However, the Zeppelin got on an even keel before touching the water, and she struggled upward again, her machinery being apparently still workable. It was a pity that by this time the seaplane also was in Queer Street, for we saw him standing away, making for the coast. I was pleased to learn, when I reached port, that he got home safely.'"

RUSSIA

The following is the official report for August 31st:

"In the region of the village of Velitzk, in the direction of Kovel, two enemy aeroplanes attacked one of our machines, which was brought down within our lines.

"The gallant aviator, Sub-Lieutenant Tikhomiroff, and the observer, Lieutenant Danilevitch, perished."

TURKEY

The following is the official report for August 31st.

"Of five enemy aeroplanes which ascended from an aircraft vessel in the waters of Ghaza and dropped bombs one was compelled to descend. It was captured with its pilot. Two enemy aeroplanes which appeared on the same day over El Arish were put to flight by our fire."

MODEL NEWS

Edited by G. A. Cavanagh and Harry Schultz

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
29 West 39th Street, New York City

PACIFIC NORTHWEST MODEL AERO CLUB
9915 Ravenna Boulevard, Seattle, Wash.

LONG ISLAND MODEL AERO CLUB
401 Grant Avenue, Cypress Hills, L. I.

BAY RIDGE MODEL CLUB
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YOUNGSTOWN MODEL AERO CLUB
924 Wabash Ave., Youngstown, Ohio

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.

BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge Street, Buffalo, N. Y.

THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.

TEXAS MODEL AERO CLUB
517 Navarro Street, San Antonio, Texas

SPRINGFIELD MODEL AERO CLUB
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MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
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PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Motor for Model Aeroplanes

(*Continued from page 726*)

CO_2 MOTORS.

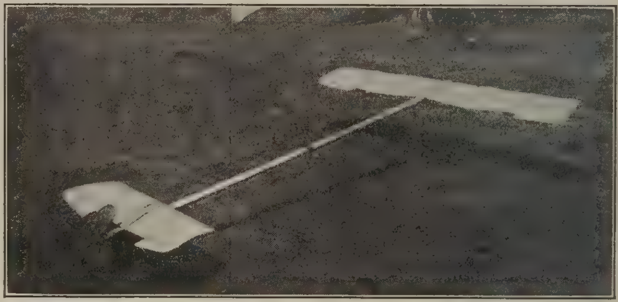
Carbon dioxide gas in a liquid form is a well-known commercial product in England, stored in steel cylinders. At a pressure of some 35 atmospheres this gas condenses to a liquid at 0° C., or it may be liquefied at ordinary atmospheric pressure by a temperature of —78° C. The liquefaction of the gas can be effected either by evolving it in a strong closed vessel, so that it is condensed by its own pressure, or by pumping the gas by means of an ordinary forcing pump into a strong wrought-iron or steel receiver, kept during the process at a temperature of 0°. As soon as the volume of gas pumped in amounts to about thirty-seven times the volume of the receiver, each stroke of the pump produces a further condensation of the gas which is pumped in, and the vessel is easily filled with liquid CO_2 which is colorless and transparent. On being allowed to escape into the air, more especially if it emerges through a fine nozzle attached to the vessel, part of the liquid at once evaporates and assumes the gaseous state, so much heat being thereby lost that the remainder has no longer the necessary heat to maintain it in a liquid state. It therefore promptly freezes, thus producing a white snow-like mass (known popularly as carbonic acid snow) which evaporates comparatively slowly.

Liquefied CO_2 in expanding produces an enormous pressure which can be readily used in a motor provided that the freezing difficulty just referred to can be successfully overcome: it has this advantage over compressed air, that for the same quantity of gas, the pressure on the reservoir is much less, which removes the likelihood of an explosion—giving either a reduced weight or a greater factor of safety. One peculiarity of the liquefied form of the gas is that under the application of heat the liquid form expands more than the gaseous —being an exception to the rule that liquids expand by heat less than gases.

In the Cetonia CO_2 motor (by term motor we mean complete plant) the freezing difficulty is overcome by using a cylinder filled with water at a temperature of about 90° C.; through this cylinder (or hot water bottle) runs a network of tubing into which the liquid CO_2 is passed direct, immersed as already stated in nearly boiling water. Now since CO_2 cannot remain liquid at a temperature above 31° C., its critical point, it immediately turns itself into a gas, and freezing is absolutely prevented by the specific heat of the water, which is very high.

(*To be continued.*)

The above photograph shows a model of a Nieuport monoplane constructed by Willard L. Gleason, of Dallas, Texas.



The model shown in the above photograph was constructed by Mr. Wegand, of the Buffalo Aero Science Club, the description of which appeared in our issue of September 4th.

Milwaukee Model Aero Club

The Milwaukee Model Aero Club has recently held two rousing meetings at which much renewed interest was displayed. At the second of these meetings, held August 25, at the home of Alfred Hayden, the annual election of officers was held. The results were as follows: President, Erwin Eiring; Vice-President, Ted Sedgwick; Secretary, Alfred Hayden; Treasurer, Kenneth Sedgwick. The newly elected president appointed Walter Loehndorf as field director.

On August 27 an R. O. G. duration contest was held. A second and third meet will be held on September 3 and 9 respectively. The boy having the best average for the three meets will be presented with a silver cup donated by Henry P. Ammidown. The three best flights made by each boy at each meet are to be counted in figuring the average. The result of the first meet was as follows: Edwin Eiring, average, 80 seconds; Alfred Hayden, 75 seconds; Lynn Davies, 74 seconds. Davies made a flight of 122 seconds, thus breaking the former club record by 25 seconds. He did not do as consistent good flying as the other two boys, however, so his average was lower. The averages of the other boys entered were low owing to bad luck of various kinds.

The club will probably fly in the National contest for the first time in September, while on September 23 and 24 a contest for hydros will be held for a large silver cup.

During the month, Lynn Davies made a hand launched record of 132 seconds, beating the old record by 1 second.

As the vice-president acts as corresponding secretary, kindly send all club matters to Ted Sedgwick, 625 Frederick avenue, in the future instead of Gilbert Counsell.

New Method of Stability Discovered by College Students

Claude Robertson, post graduate student at the University of Chicago, sent a big wooden Y hurtling through the air the other day and it kept its equilibrium for 600 feet, returning to the spot from which it was flung.

This may not seem startling news, but the wooden Y, or boomerang, may be the forerunner of a superdreadnaught aeroplane that will have greater speed and stability than any aircraft heretofore invented, for Robertson believes his discoveries can be applied directly to airships.

Robertson's boomerang was under perfect control when it went through space and there was almost no friction with the air.

It is about two feet from stem-end to the end of each branch, and it is about four inches across. The boomerang which made the journey of 600 feet and returned to the exact spot from which it was flung is made of specially treated wood. It moves so swiftly the eye can scarcely follow it.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

She Understood

Aviator (home from the war on leave)—And then when you are up pretty high—three or four miles, say—and you look down, it is stupendous, awful. A great height is a fearful thing, I can tell you.

Lady (feelingly)—Yes, I can sympathize with you, poor boy. I feel just that way myself when I'm on top of a stepladder.—*Tiger.*

A Flying Lesson

Now all you young fliers what's gathered today
You shut up your rag-box and hark to my lay;
And I'll sing you a flier as far as I may
A fellow that's fit for a flier.

You must rise in the morning at three-forty-five
Walk down to the hangars and show you're alive;
Fill up the tractor with gas and with oil
Pour in the water to make sure she won't boil.

Put on your goggles and old leather coat
A life-belt is useful if you're flying a boat;
Crank up the motor and glance at the "Tach"
If she turns fourteen hundred she'll never go back.

Pull down the throttle and test your controls
Give Billy the high-sign and away she will roll;
Wave your hand in a parting farewell
Up comes her tail and you're going like Hell.

Now mind you don't climb at an angle too steep
Just take her up slowly and don't try to leap;
Don't be in a hurry to fly way up high
There's plenty of space between you and the sky.

When you take your first corner don't think of the ground
Just push on the rudder and bank her around;
Take care you're not climbing and don't drop too much.
To be a good flier you must have a light touch.

Be gentle and easy with all your controls
You can fly mighty steady, but sometimes she rolls;
And always remember as you fly into space
To keep your eyes open for a good landing place.

Good landings come slowly, but get them down pat
A tractor is poody and as quick as a cat;
Level off easy and bring her tail down
A touch on the rudder will swing her around.

Just a line or two more and then I am through
Take my advice and don't hurry through;
Absorb all the knowledge you can of the game
Don't get the swelled head, and you'll win lots of fame.

W. G. Schauffler, Jr.
Curtiss Aviation School, Newport News, Virginia.

Literally

"Here are a lot of suggestions from outsiders as to how to run this newspaper. See that they are carried out."

"Yes, sir," said the office-boy, and, putting them all in a waste-paper basket, promptly carried them out.

Mechanic—"I'd like a nice pair of flannels for about three dollars."

Clerk—"I'm sorry, sir, but we haven't any nice ones at that price."

A Bum Steer

Pilot (with worried look): "I'm afraid the rudder is broken."

Fair Passenger (sympathetically): "Oh, never mind, it is behind us most of the time and no one will notice it."

Quick, Henry—the Self-starter

Gearshift—"We were out in the machine yesterday and got caught by the storm."

Magneto—"It must have been unpleasant."

Gearshift—"Oh, no; it was a driving rain."

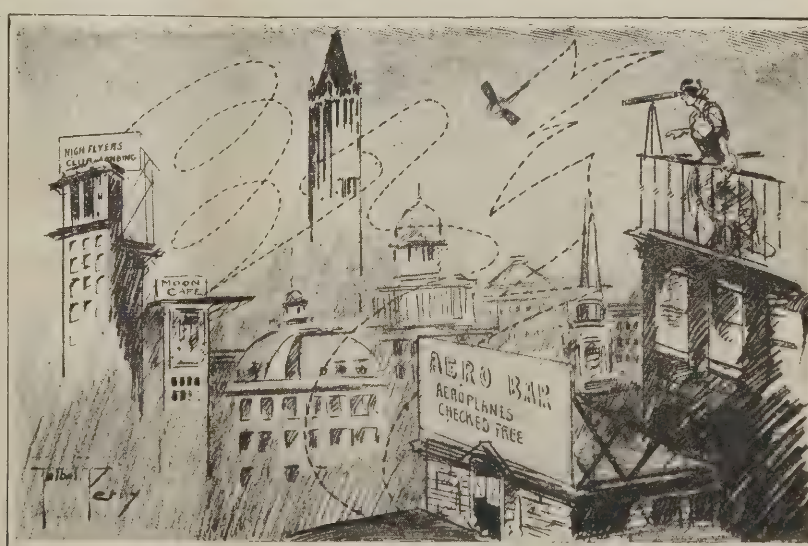
There Was a Reason

Bridges—I wonder how Henpeck came to buy an aeroplane. Do you know?

Rivers—Yes. He said he thought maybe his wife wouldn't be so free to find fault with him after she saw how much trouble he was having with his machine.

1950

"And he promised to come straight home from the office!"



Air Ferry Over Great South Bay

A hydro-aeroplane ferry service was instituted Labor Day between Avery's Beach and Fire Island Beach, distance of five miles across Great South Bay. The fare was $10 a round trip and the expedition proved popular. About a score made the trip, most of them women.

Harry Witts, an aviator of Bay Shore, who is visiting Dr. John A. Hayes, was the ferryman. Most of his patrons were members of the summer colony. Among them were Mrs. Allan H. Whiting, of 169 West Ninety-fifth street; Miss Alice Ballinger, of 23 West Eighty-fourth street, and the Misses Grace McDermott, Edith Frey, Dorothy Parks and Helen Witzel, of Brooklyn.

Mail by Aeroplane in Alaska Soon

Preparation of the Post Office Department to let a contract for mail delivery in Alaska by areoplane was announced in the House of Representatives, September 2nd, by Representative Murray Hulbert of New York, who inserted in the record figures relating to the pioneer aerial mail route. Delivery of mail by aeroplane, according to Mr. Hulbert, will be made between Seward and Nome, with Iditaro as a distributing center, for interior deliveries by dog-sled routes. Quicker deliveries will be possible throughout Alaska, he says, because of aeroplane transportation.

"The department," said Mr. Hulbert today, "has received a bid from Earl L. Byers for aeroplane delivery at $49,500 a year. This calls for deliveries twice a week all the year and a weight limit of 1,000 pounds. Inauguration of the first aeroplane delivery route will soon be announced by the department."

Mr. Hulbert explained that his interest in the mail route is in spirit with the interest of his district in aeronautic development.

Castle Reported Killed

An unconfirmed rumor has reached New York that Vernon Castle, actor and dancer, who went abroad several months ago to join the British colors, had been killed in action in France. The information came in a letter to Miss Mildred Francis, who used to be on the stage, from Lieutenant Lewis Sloden, a member of the Royal Flying Corps. According to Sloden, Castle was killed two weeks ago while flying over the German lines.

Castle trained as an aviator in this country before reporting for service in England. He was in training there in the Royal Flying Corps when Mrs. Castle visited him recently.

The L. V. G. Battleplane

(*Continued from page* 782)

struts on the bottom plane, and then vertically to the aileron bar slotted in the upper plane. Movement of the lever from side to side pulls the aileron bar up or down. Tail flaps are turned downward and upward by a forward and backward movement of the lever.

Landing Gear

The undercarriage is almost identical with that of the Albatross biplanes. In older models a third wheel was fitted on the lower ends of two struts sloping down from the front part of the body and braced by tubes running backwards and outwards to the angle formed by the axle and the main chassis struts. The extra wheel has been omitted in the later model, having, in fact, always been detachable and chiefly used for school work to protect the propeller and prevent the machine from turning over on its nose in case of a bad landing.

A refinement noticeable in this machine is the arrangement of the tail skid, which has the rudder shock absorber placed inside the body to save resistance.

Motor Group

The 160-h.p. Mercedes motor is mounted in the nose of the machine, partly enclosed by the aluminum top cover of the body. The simple arrangement of exhaust pipes consists of a short branch pipe from each cylinder running to a vertical collector pipe projecting upwards above the level of the upper plane.

An unusual mounting of the radiator is employed, as will be seen from the illustrations. The radiator, instead of being mounted on the sides of the body as in the earlier machines, is built into the top plane, tubes running from it down to the front and back of the motor.

A Correction

In our issue of August 21st, in a report covering the license tests of Mrs. Waldo Pierce, at the Wright Flying School, we stated that she was the only woman amateur license holder in the United States. Our attention has been called to the fact that Mrs. Richberg Hornsby, who holds pilot license No. 301, shares honors with Mrs. Pierce. Mrs. Hornsby owns her own machine, which she has been flying during the past summer near Chicago. Mrs. Hornsby is now in New York, and will probably be seen in the air in the East in the near future.

(*Continued from page* 780)

Executive Head of School	5,000
Gasoline	3,500
Oil	600
Rent of Flying Field	10,000
Total	$84,900

"From the above, it is quite apparent that a rather high cost per pupil will be necessary, in order to run such a school at cost. In view of the above, we would suggest that the Government in addition to supervising, purchase the school machines outright for the first year and pay $1,000 tuition for each student who graduates from the school and qualifies for the Army finishing school."

Whereas civilian schools are willing to forego profits, the Government can either run the schools or pay at least the actual cost of training the men. There is no alternative, excepting to foresee the schools to place an excessive number of students to one instructor, which would greatly delay the training of men and cause an economic waste. Therefore, this alternative cannot be considered, and the Aero Club of America has advised against wasting time to test this last alternative.

Ten Military Aviation Schools Needed for Advanced Training

Ten Army aviation schools are needed for advanced military training. They are also needed as military aviation centers where the Aerial Reserve Corps and the National Guard Aero Squadrons will be mobilized for manoeuvers and annaual practice. These aviation centers must be established in different parts of the country, and almost any locality which can supply the acreage of clear ground is good for this purpose, since it is necessary to train aviators so that they can fly in all conditions, including snow-bound country.

In these advanced Army aviation schools, the aviators will complete their training in the manipulation of aeroplanes, working out of military problems, studying motors, instruments, aerodynamics, meteorology, etc.

It may be mentioned here that England alone has 94 aviation schools.

The above is merely the skeleton of the plan, but it shows how thoroughly feasible it is to train one thousand aviators within twelve months.

(*Continued from page* 779)

in every case operates to raise the low side when a gust of wind threatens to derange its equilibrium.

Unique among all other successful aeroplanes, the Dunne has no tail, nor has it vertical rudders. The steering, both from right to left and up and down is accomplished solely through the ailerons or flaps at the rear tips of the wings. So perfectly balanced is the aeroplane that the machine may be put on a bank, the controls locked, and it will continue indefinitely to circle at the same angle without any further action by the operator.

It was the marvel of this which roused England as long ago as 1912 to the merits of this type, but the coming of the war and the necessity of producing purely military aeroplanes prevented its development there.

It was in 1913 that W. Starling Burgess, president of the Burgess Co., was impressed with the merits of the Dunne machine, while on a visit to England. He at once acquired the exclusive American rights and since that time has worked out the Dunne system in a perfection of detail hitherto unknown.

The construction has been greatly simplified, and the weight cut down to an appreciable degree through refinement in design, until the Dunne system now not only retains its feature of inherent stability, far in excess of any other type, but vies in efficiency with any manually controlled machine produced.

In this latest Burgess production the Dunne system of inherent or automatic balance is superimposed on a sturdy and seaworthy hull, a combination affording the first air and water craft suitable through its security for general use by sportsmen.

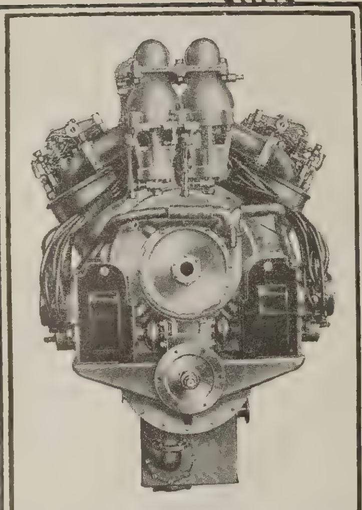
AERIAL AGE WEEKLY

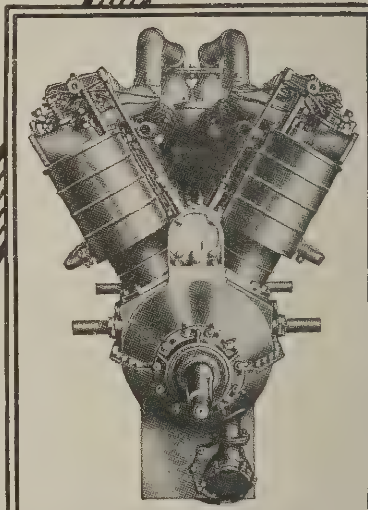
VOL. 3, No. 26 SEPTEMBER 11, 1916 10 CENTS A COPY

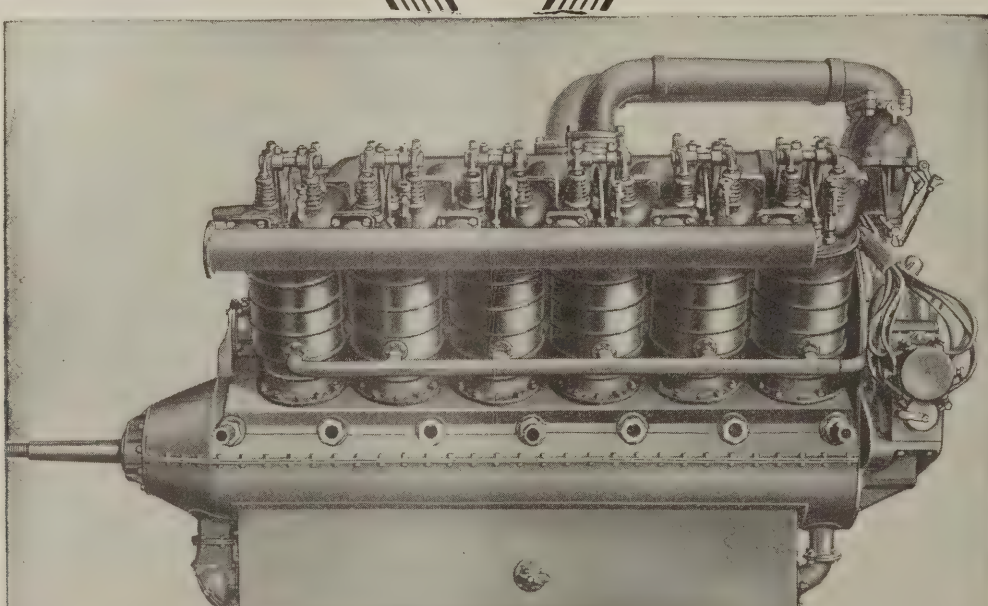
United States Must Be Prevented From Making Mistake England Made

The L. V. G. Battleplane Described

The Armament of the Fokker







Advertising in this department 10c. a word $2.50 minimum

Classified Advertising

Forms close for this department on Monday preceding date of issue

FOR SALE: TWO TRAINING BIPLANES IN good condition, equipped with 100 H. P. and 50 H. P. Gnome engines, respectively. Box 88, Aerial Age, Foster Building, Fortieth Street and Madison, New York City.

WANTED: 6-CYLINDER, 45 H.P. ANZANI Radial Motor. Must be cheap and in good running condition. Box 829, Bridgeport, Conn.

CHICAGO AERO WORKS, AEROPLANES. Drawings, Supplies and everything Aeronautical. Send stamp for catalog. Makers of the famous Stupar Tractors, etc. 345 River Street, Chicago, Ill.

LARGE, SEMI-FARMAN TYPE, UNUSED biplane $275. Bleriot parts $175. Used 7, 7½ and 8 ft: propellers $20. Patterson, 1950 East Jefferson, Detroit, Michigan.

INTERESTED IN AERONAUTICS? IF SO, why not join a progressive Club. Be associated with those who possess expert knowledge on the construction and flying of model aircraft and aviation in general. Write for information. Aero Science Club of America, Secretary, Engineers Building, 29 West 39th Street, New York City.

FOR SALE: 6-50 KIRKHAM, NEW TRAC-tor propeller and side radiators $425.00. Box 93, Aerial Age, Foster Building, Madison Ave. and 40th St., New York City.

FOR SALE: CURTISS 80 H.P. BIPLANE, first class condition $2000. Can be seen at Sperry Gyroscope Bldg., Brooklyn, N. Y. Mrs. Wm. S. Luckey, 508 West 178th Street, New York City.

MODELS—MODEL AEROPLANES, ACCES-sories and supplies. Material suitable for the construction of models that will FLY. Moderate prices. Prompt deliveries. Complete catalog free on request. Wading River Mfg. Co., Wading River, N. Y.

FOR SALE: 125 H.P. HALL-SCOTT MOTOR that has never been run. Just the thing for aviation school or professional flyer looking for a high-class motor for quick delivery. Box 79, Aerial Age, 116 West 32nd Street, New York City.

MY $7,000 GENUINE CURTISS FLYING boat model F and $1000 equipment for sale for $3000. Cash. Can demonstrate at Chicago. Jack Vilas Woodruff, Wisconsin.

WELL EDUCATED YOUNG MAN, SIX years' experience gasoline motors, desires financial aid to become aviator, will give personal service or good security in return. Box 90, Aerial Age, Foster Bldg., Madison Ave. and Fortieth St., New York City.

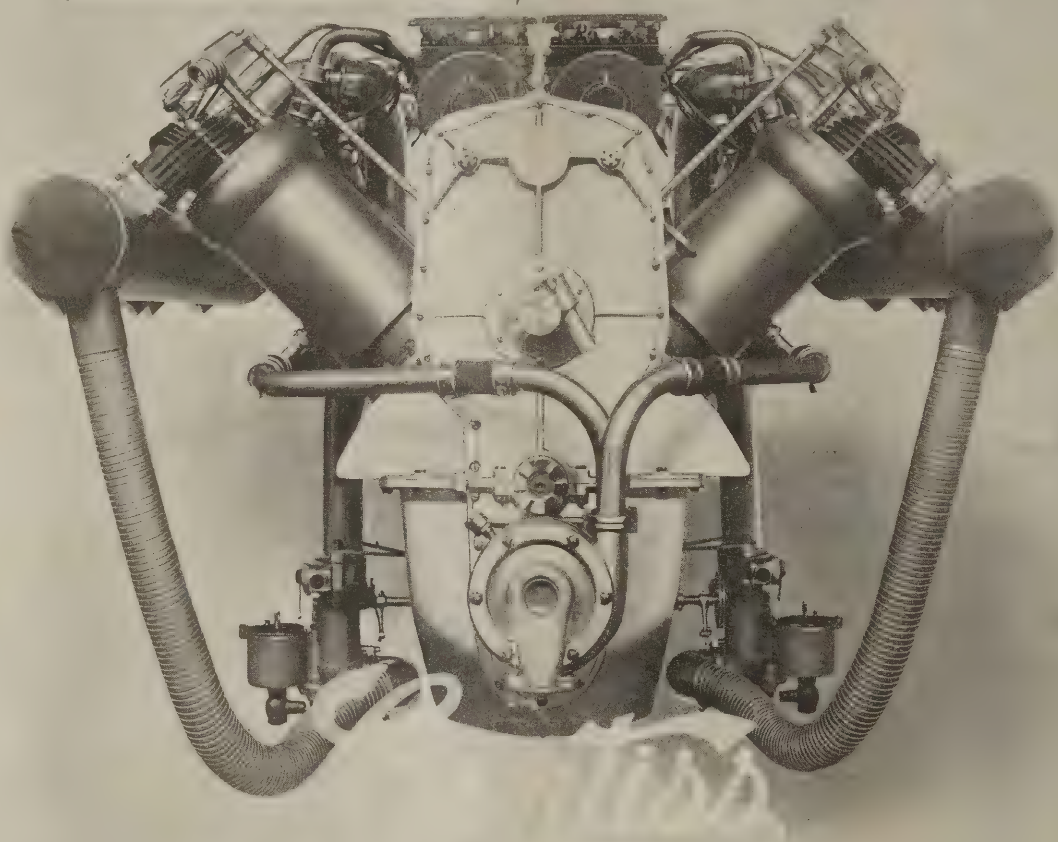
LEARN FLYING. AERO CLUB LICENSE guaranteed. Flying instruction given students at Sheepshead Bay Speedway daily and Sunday from sunrise to sunset. Tractor biplane and monoplane used. Eastern Aeroplane Company, Inc., 1251 DeKalb Avenue, Brooklyn, New York.

BARGAIN IN USED MOTORS. WE NEED the cash. Four-cylinder 40-60 h.p. Eldridge, $125; 4-cylinder 40-50 h.p. Maximotor, $350; 6 x 75 h.p. Roberts, $650; 6-cylinder 85 h.p. Kirkham (Aeromarine), $750; 6-cylinder 100 h.p. Maximotor, $750. All in good condition. Particulars upon request. Maximotor Company, 1530 E. Jefferson Avenue, Detroit, Mich.

WANTED: EXPERIENCED MAN FOR AD-vertising purposes. Mostly publicity work. Aeronautical knowledge, especially dirigible aircraft desirable. Reference required. Box 95, Aerial Age, Foster Building, Madison Ave. and 40th St., New York City.

THE HALL FLYING SCHOOL AT EXPO-sition Park, Penna., on beautiful Conneant Lake near Meadville, guarantees to teach you in less time and at less expense than you can learn elsewhere. New 100 horse "Dep" Control Flying Boat. Write for particulars.

ELEVEN Curtiss machines equipped with Model V-X motors are in constant service on the Mexican border. Hundreds of flights are being made. Extraordinarily difficult conditions have been successfully overcome by these motors.



MODEL VX

At Colonia Dublan, on the Mexican border, these motors are making reconnaissance flights of great value, giving steady, full service.

RATED 160 H. P.

CAREY PTG. CO., INC.